AMERICA IN SPITSBERGEN

THE ROMANCE OF AN ARCTIC COAL-MINE

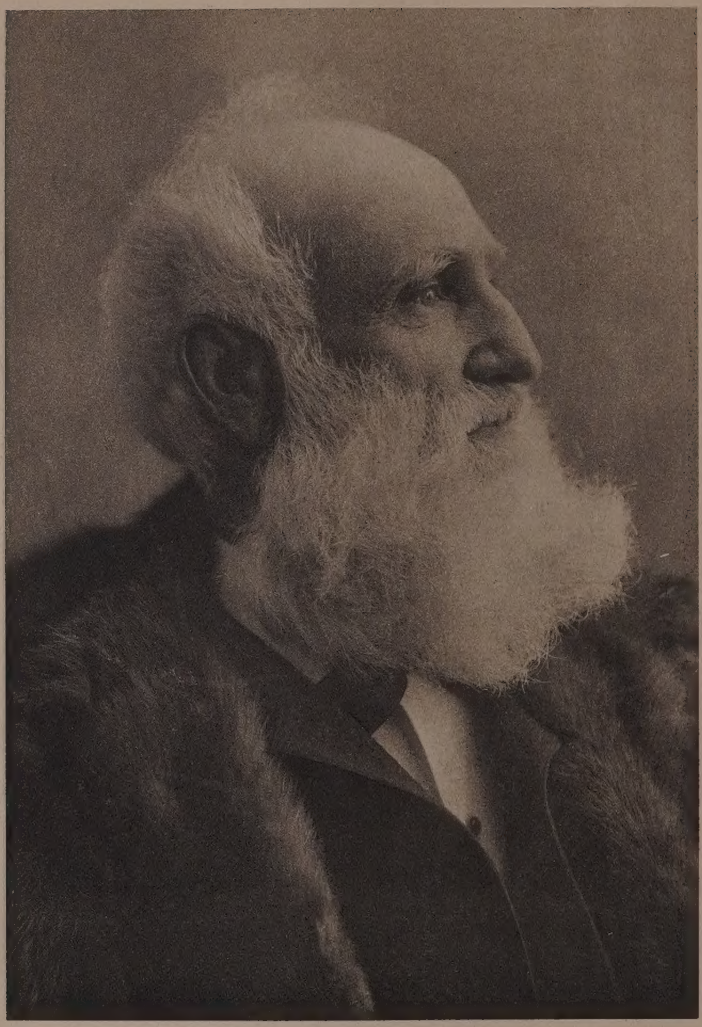
VOLUME I

Ἡ δ' ἐς πείραθ' ἵκανε βαθυρρόου Ὠκεανοῖο.
Ἔνθα δὲ Κιμμερίων ἀνδρῶν δῆμός τε πόλις τε,
ἠέρι καὶ νεφέλῃ κεκαλυμμένοι· οὐδὲ ποτ' αὐτοὺς
Ἠέλιος φαέθων καταδέρκεται ἀκτίνεσσιν,
οὔθ' ὁπότ' ἂν στείχῃσι πρὸς οὐρανὸν ἀστερόεντα,
οὔθ' ὅτ' ἂν ἂψ ἐπὶ γαῖαν ἀπ' οὐρανόθεν προτράπηται·
ἀλλ' ἐπὶ νὺξ ὀλοὴ τέταται δειλοῖσι βροτοῖσιν.
νῆα μέν, ἔνθ' ἐλθόντες, ἐκέλσαμεν.

(Ὀδυσσείας λ: ιγ'—κ')

NOW *we came to the deep-flowing Ocean's ultimate bound,*
where the Kimmerians' gloomy tribe and city are found
wrapt in perpetual clouds; nor ever on them looks the Sun
shining with glorious beams as his marvellous journey is run,
whether he mount to the sky all spangled with stars without end,
whether he turn him agen from the sky to the earth to descend;
but the baleful Night broods over the children of wo.
Thither we ran the ship.

ODYSSEY: *Book* XI, 13-20



AMERICA IN SPITSBERGEN

The Romance of an Arctic Coal-Mine

WITH AN INTRODUCTION RELATING THE HISTORY AND DESCRIBING THE LAND AND THE FLORA AND FAUNA OF SPITSBERGEN

BY
NATHAN HASKELL DOLE

IN TWO VOLUMES
VOLUME I

BOSTON
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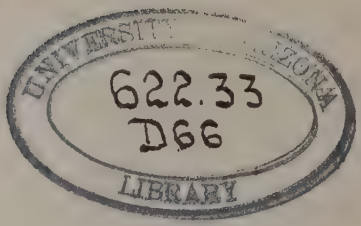

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AN APPRECIATION

MR. LONGYEAR was looking forward with keen interest to the publication of "America in Spitsbergen." His plan to send the two volumes, illustrated with reproductions of his own photographs, as gifts to his many friends and especially to those that were associated with him in the romantic and unusual enterprise established by him in the far islands of the Arctic, will be carried out by his wife. He had twice read the typoscript of the work, had made many modifications and suggestions and had carefully gone over all the page proofs, except about two hundred pages of the second volume.

Then, early Sunday morning, the twenty-eighth of May, the sudden call came and he passed on into the unexplored Beyond, taking that wonderful and mysterious journey which we all must take, quietly, without fear or pain, alone.

These volumes are a memorial to him, and it is appropriate that a few words should be added to the record of his dominating connection with it. It is not merely the story of a mine, however romantic and unusual that story may be. His deeds and his words are throughout recorded with the intention of making it a human document, even though some of the episodes are only indirectly associated with the narrative of the development of the Arctic Coal Company.

It is now suitable to say definitely, what must be apparent to any one who reads the story, that John Munro Longyear was a man of remarkable ability and character. He had accumulated a large forturne but was entirely unspoiled by his success. He was free from conceit and from arrogance. He was friendly, generous, full of humor, sincere, gracious, and a good story-teller; he had traveled widely, seen many men and many countries, gathered much information and had learned to view with a kindly eye the faults and follies of his fellow

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men. An indefatigable worker for others as well as for his family, he was imbued with the spirit of good will. He was simple-hearted and benevolent, always approachable and genial.

The news of his departure from our midst came with a shock to those of us who had learned to love him and admire him. His life offers an admirable lesson of faithfulness to high ideals, of worthy character and of well-deserved success.

NATHAN HASKELL DOLE

FOREWORD

THE ENTERPRISE of developing a new and practically unknown coal-field within eight hundred miles of the North Pole, yet so accessible during the summer months and so readily worked during the long Arctic winter as to supply at least part of the demand of the Scandinavian countries and of northwestern Russia, was an interesting and satisfactory experiment.

Considered from a commercial standpoint, it was disappointing, but pioneers frequently meet with such eventualities. Our satisfaction was derived from the assurance that we had developed an important source of fuel-supply for the benefit of mankind. This will be the only matter of consequence in the future; the loss or gain to the original explorers is of small moment.

Mr. Dole has gone over all the files of papers accumulated during the fourteen years of the American operations on Spitsbergen and has also read many books, pamphlets and documents, skilfully condensing the mass of material into the compass of the present book. He has given due credit to the loyal and indefatigable assistants who were obliged to meet many difficult and unusual problems in the establishment of so large a plant in a land lacking every necessity and so far from all sources of supplies, and in the management of hundreds of laboring men speaking a foreign language and not always amenable to discipline. How successful the American engineers and foremen were in developing this enterprise is reflected in the remarkable freedom from serious accidents and from loss of life, even when,

as happened several times, strikes were instituted by disaffected Socialistic leaders. A large share of this immunity from violence was due to the strict regulations forbidding the importation and use of alcoholic drink.

Time has softened the memory of many of the hard knocks, the disappointments and the contentions involved in certain of the incidents. After the heat and burden of the strife I can truly say that I bear no ill will to those who seemed at the time bent on making difficulties doubly difficult. Some of these controversies unavoidably enter into Mr. Dole's narration: the story could not be fully told without them; but he has avoided personalities as far as possible and the account of the settlement of them will perhaps be found sometimes amusing as well as instructive.

Looking back upon my experiences in connection with the Spitsbergen enterprise, I find that the pleasant memories mainly predominate. I hope that those who read this story of the triumphs of American engineers struggling with the unusual forces of the Far North will enjoy as I do the forcefulness, the adaptability, the good temper, and the quiet modesty of those young men, so typical of our fellow-countrymen. It is also a pleasure to know that Spitsbergen, though now under the flag of Norway, is forever dedicated to the Arts of Peace. It probably can never be drawn into international controversy.

Americans made the first serious attempt to develop the mineral resources of this wild and savage region, and here is the story of it.

JOHN MUNRO LONGYEAR

Marquette, Michigan
March 17, 1922

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INTRODUCTION

THE MAIN object of this book is to relate in full detail the history of a great coal-mine, established and brought to a paying basis on the Island of West Spitsbergen through the enterprise of two American gentlemen. The history is a romance.

Situation of Spitsbergen. Spitsbergen is the name attached to an archipelago situated in the Arctic Ocean. Its upper limits are within six hundred miles of the North Pole. From Advent Bay, where the mine is located, the distance to London is seventeen hundred and fifty miles; it is eleven hundred and fifty miles to Bergen, in Norway, and five hundred and twenty miles to the northern town of Tromsø. It is six hundred and fifty miles to Murmansk in northern Russia, or a little more than the distance from Norway to Iceland. The South Cape of Spitsbergen is separated only by a voyage of three hundred and seventy miles from the northernmost coast of Norway.

Area of Spitsbergen. West Spitsbergen has about fifteen thousand square miles; North-East Land, called by the English whalers Heley and Edge, Sir Thomas Smyth Land, or Smith Land, has about four thousand; Edge Island, first rudely marked by Joris Carolus in 1614, and supposed by him to be a part of Novaya Zemlya, called Beare Island by Sir Robert Dudley in 1630, called Staaten Land on the Dutch Company's chart in 1634, and Whales Wiches Landt by Valk and Schenck in 1662, Stans Voorland in 1710, and, by the Russians, Maloï Brun, contains about twenty-five hundred square miles; Barentsz or Barents Island, blunderingly called Zuyd Ooster Land, has a thousand, and Prince Charles's Foreland, called Ericeya by Eric the Red, Black Point Isle by Jonas Poole in 1610, and, by the Dutch, Kijn Iland, after a super-

cargo who fell down one of its hills and broke his neck in 1612, has about nine hundred square miles.

The Smaller Islands. Besides these, there are innumerable larger and smaller islands, such as the Danes Island, Deadmans Island, Amsterdam Island (called by Barents Gebroocken Land), Vogelsang, Cloven Cliff, the Inner and Outer Norways (Zeeusche Uytkyk or Zeeland Outlook), Moffen Island, Luysen Eyland or the Riff, Halfmoon Islands, Hope Island (discovered by Marmaduke of Hull in 1613), the Seven Islands, Hoogberg and Taafelberg Islands, Vlak or Scoresby Island and the Thousand Islands.

The total area of the Spitsbergen group is variously estimated as between twenty-five thousand and thirty thousand square miles, corresponding quite closely to that of Scotland or Greece, or Ceylon, or the State of Maine, perhaps a quarter as large as Norway, and three-quarters as large as Iceland.

Historical Relationships. From a geographical as well as from a scientific standpoint, and even more in its historical relationship with the nations of Holland, England, Norway, Sweden, and Russia, it is one of the most interesting portions of the globe. Owing to its exceptional climate, as modified by the deflection of a branch of the warm Gulf Stream, which rescues its western coast from the tyranny of the polar frost, it has been for more than three centuries, and especially during the seventeenth, a great center of the whaling-industry. For about a hundred years it has attracted the attention of European scientists. By reason of its comparative proximity to the North Pole, and its open sea, often allowing ships to sail beyond the eightieth degree of North Latitude, it has been many times selected as the basis for tentative expeditions to attain that elusive goal.

A No-Man's Land. Discoveries of its natural resources in coal, iron, asbestos, gypsum, marble and other commodities, have attracted the attention of the "competitive nations;" and yet until 1918 their respective rivalries have prevented any settlement as to its governmental control or even its status as a *terra nullius,* guarded and policed by responsible authority.

The result has been chaos and virtual extermination of the exuberant animal life,—the walrus, the Polar bear, the reindeer and the eider duck, which in former years were the wonder and admiration of visitors. Its assignment to Norway opens a new epoch in its history. The great coal-mine abovementioned went into the hands of Norwegian capitalists just before Norway was granted possession of the Archipelago. Consequently the story of its inception and development, at least as far as America is concerned, is practically complete.

It was at first intended to preface the story of this particular enterprise with a rather full account of the general history of the earlier ventures in its waters and on its rugged shores; but the recent publication of Dr. R. N. Rudmose Brown's book, entitled "Spitsbergen: An Account of Exploration, Hunting, the Mineral Riches and Future Potentialities of an Arctic Archipelago," seemed to render unnecessary a repetition of his generally excellent and authentic material. His work and those of Sir Martin Conway, which are easily available, will supplement and extend such other details as the author has deemed it suitable to include in the following Introduction.

Many weeks have been spent in examining historical and scientific works by Norwegian and Swedish writers, and also volumes in Dutch, French, German, and English. Some of this matter it seemed worth while to include, as it is not so easy to procure. The material for the main body of the work has been put into the author's hands by Mr. John Munro Longyear, to whom he is indebted also for constant encouragement and assistance, and for the illustrations which add so much to its value.

NATHAN HASKELL DOLE

BOSTON

April, MDCDXXII

Part One

HISTORY AND SKETCH OF THE LAND OF SPITSBERGEN ITS FAUNA, FLORA AND OTHER NATURAL PRODUCTS

America in Spitsbergen

I. AN ARCTIC ARCHIPELAGO

1. THE MAKING OF A LAND

OUR TINY world, spinning around the Sun and accompanying it in its mysterious unknown journey through the infinities of space, is so balanced that the poles are half the time exposed to daylight and half the time palled in night. It may be that in far-distant æons slow oscillations in its revolution brought what are now the North and South Poles into a fuller radiance of light and heat. In that case there would have been a different distribution of temperature from what obtains at the present time. Even if this theory be mistaken, there would have been sufficient heat from the surface of the earth, as it slowly cooled, to communicate itself to the dense atmosphere filled with carbon-gases and to stimulate to rapid growth the flora which from all indications must have flourished with immense prodigality. Tree-ferns of monstrous size and all sorts of vegetation came into being to perish, to be buried, and, in the processes of Nature, to be carbonized under pressure, thus forming the beds of hard and bituminous coal found in almost every part of the round world.

THE UNSTABLE LAND. "The stable land" is far from stable. In our own time the surface of the earth is in many places either slowly rising or sinking. Harbors once suitable for great ships have become shallow; cities, once seaports, have found themselves far inland; or, on the contrary, have been swallowed by the waves. Almost all countries bordering the sea have legends telling of such submerged towns, with the bells occasionally heard booming through the depths—towns perhaps destined to flourish again. The still more widely

diffused myth of the Deluge points to a similar origin. The story related by Plato of the lost-continent Atlantis, which is supposed to be now represented only by a few mountainous islands—the Azores and Teneriffe—between the Eastern and Western hemispheres, may therefore have a basis of fact.

Soundings to the north of Europe make plausible the theory that at some distant period of time there was a huge tableland which stretched uninterruptedly from Scandinavia to Greenland and from Greenland to America. Botanists have recognized in New Mexico plants which must have had their original habitat in the Far North and which then flourished abundantly and traveled westward and southward for thousands of miles. In their birth-place they are now represented only by fossils, their stems, leaves and flowers imprinted in deathless characters in the great rock-book of Nature.

This theory is proved beyond cavil by the similarity of the mountainous shores of Scandinavia and the islands lying to the North. The billow-like submergence and reappearance of this land were probably effected many times in the course of millions of years but more and more slowly as the earth's crust hardened until in our day, as is shown by the presence of bars across the mouths of harbors practically unchanged for several centuries, equilibrium seems to have been attained.

Nature's Work of Erosion. Like tools work similarly on like materials. Nature, with all her variety and resourcefulness, proceeds according to the same general plan in her destructive and constructive operations. The volcanic forces imprisoned under the surface of the earth lift up a vast mass of once molten rock in comparatively smooth and rounded form. Powerful rains, perhaps laden with disintegrating acids, fell on their tops and sides and began their operation of erosion. Pouring down to the sea, they cut away the tough gneiss and granite and chiseled runnels, until in the course of millenniums sharp-pointed peaks were left separated from one another by valleys through which rushed rivers still further disintegrating the rocks and carrying the débris into the ocean,

where it was deposited in layers to be hardened into sandstone or conglomerate.

When the land sank once more the ever-gnawing waves continued the process. On the soft, submerged flats grew millions of mollusks, the shells of which went to make limestone, often leaving the impress of their forms and markings in the consequent rock. Then the next oscillation of elevation took them high above the sea to places where exposure allows them to tell the mute story of their lives. The soil formed by this process of comminution was fertile; under the prevalent conditions of warmth and moisture it bore all kinds of vegetation. On these islands flourished alders, firs, ferns, magnolias and many other plants, trees and bushes, including the Ginkgo, of the Yew family, which is now native to Japan.

Glacial Changes. As the climate grew colder immense quantities of snow fell, filling the valley, partially melting in the summers and forming immense glaciers which from the pull of gravitation flowed slowly toward the sea, grinding the rocky sides and foundations into fine dust and carrying with them enormous quantities of loose rocks torn from the mountains, thus forming moraines composed of slime and boulders and making wide deltas and shallows in the submerged valleys.

How rapidly geological and topographical conditions are likely to have changed in Spitsbergen, may be illustrated by the glacier in Horn Sound. It was known to the early Dutch navigators as affording two excellent anchorages. An arm of the bay with two islands in it stretched out toward the North. At the present time this arm is completely filled by a glacier and there are no islands. Similar irruptions of the glacial ice have obliterated natural features in other bays and fjords, causing discredit to be thrown on some of the old maps. More striking in its rapidity has been the behavior of a glacier in Van Mijen Bay. Less than a century ago one of the best harbors was just east of Axel Island. Whalers on their way from the north coast to Wybe Jansz Water were accustomed to anchor there in order to hunt reindeer in the neighboring valleys. In 1858 the shores of this harbor were still an open

stretch of swampy land through which meandered many brooks. To the west rose lofty mountains; on the northeast there was a hill crowned with a mortuary cross; to the east marshy ground extended to Coal Mountain, and a much larger stream flowed down to the harbor.

Fritjof Glacier. Directly above the banks of mud and clay of which the marshy borders of the harbor were formed began a low, wide glacier which did not end, as is usual with the Spitsbergen glaciers, in an abrupt break and was consequently regarded as retreating; but during the winter of 1860-61, it was suddenly seized with new life: it invaded the harbor, filling it completely, and pressed on outward into the sea. It is now known as the Fritjof glacier—one of the greatest in Spitsbergen.

It is believed that when the land first emerged from the ocean it consisted of a great table-land which was cut down by the action of the elements, especially the ice. Had it not been that there was a continued process of elevation it is quite possible that the tough crystalline, slate and quartzite rocks which resisted longest, would have been smoothed away and the whole land would have been reduced to such a low level that it would have been practically ice-free. The remains of whales and of great logs found at a height of fifteen to thirty meters above the present sea level indicate a rise of at least that amount, for these bones are attributed to the activities of the early whale-fishers. Nordenskjöld, however, thinks that they were pushed up on land by drift-ice. So abundant are these bones that in 1873 a steamship was sent up from Norway to collect them for a guano factory; but the undertaking proved not to be financially profitable.

In long ages the strata of vegetable material were covered with layers of solid rock which are found, now elevated hundreds of feet above the sea and now striking downward, at greater or less regularity of inclination until they reach the sea level. Sometimes they continue beneath its surface until, as by another billow of resurgence, these parallel strata mount again in lofty hills across the submerged valley. Volcanic or

other natural forces stored in these islands the primitive rock known as diabase, limestone, and marble, beds of asbestos, and many other substances which the civilization of our day values. Mighty convulsions bent and twisted the fabric of the earth's crust so that scientists find side by side, or piled on top of one another in inverse relation to the ages in which they were produced, the particular formations of the Permian, the Permo-Carboniferous, the Triassic, the Jurassic, the Mesozoic, the Devonian, and the Tertiary, each characterized by its own form of rocks and of fossils. Here for the first time Swedish geologists discovered signs of former life in the Heklahook formation. Plants now existent in the Alps once flourished on that primitive soil. Giant saurians abounded at one period and their *excrementa* in rounded form and as heavy as cannon-balls are so rich in nitrogenous substances that an industry for utilizing them as a fertilizer was organized in Sweden a few years ago. Many of them have been brought to this country and placed in museums of natural history.

These islands, lying less than eight hundred miles from the North Pole and, with the exception of a part of Greenland, the nearest land to the top of the earth, are washed on the western shores by the Gulf Stream, the comparatively warm waters of which have for millenniums exerted a profound influence on the temperature. This ocean-river, which comes up from the Cape of Good Hope, crosses the Atlantic, enters the Gulf of Mexico, passing out by the Bahamas, and meeting the cold current from Baffin's Bay near Newfoundland, is deflected toward the northeast and, skirting the shores of Great Britain, flows north along Norway and meeting a westerly current from the region of Novaya Zemlya, or New Land, turns northwest and, preventing the ice from spreading across the North Sea, carries its warmer temperature into the Arctic, all the time preserving its individuality in spite of numerous collisions with icy currents from the Far North, until at last, with a swifter flow, it again crosses the Atlantic and, coalescing with the cold Arctic Current, streams down the Atlantic coast, bringing icebergs and profoundly influencing the climate of

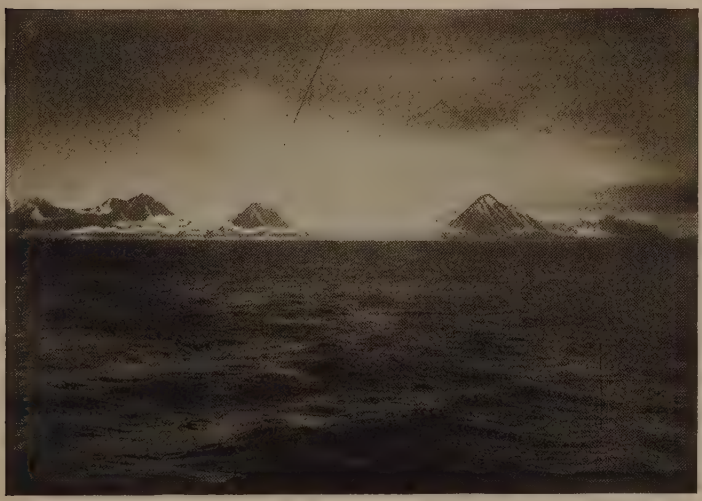
Labrador, Newfoundland, Canada, and the Eastern States of our own country.

On this marvellous river, through the ages have come the flotsam and jetsam of the "seven seas"—trunks of trees from Africa and South America, some of them sixty or seventy feet long, torn up by the roots probably by a Tropical tornado, carvings fashioned by Caribbean savages, wreckage of ships, pipe-staves, the timber sound and solid though having drifted for months and years, to be at last heaved up by the waves or driven by the irresistible urge of the icefloes high on the shores of these desolate islands. They are desolate, however, only from the human point of view. Their cliffs and bays have been for centuries the breeding-places of countless birds, whose eggs have attracted wily foxes, blue and white; on floating ice came huge polar bears to find abundant prey among the seals and walruses that filled the bays; at a time unknown appeared the reindeer probably crossing the frozen bridge, or floating over on detached floes—such cases have been known—from the continent of Asia and finding food in the mosses of the valleys and windswept ridges.

There seem to be no traces of primitive human inhabitants —no flint axes or arrow-heads have ever been dug up. Homer's "Kimmerians" who dwelt in darkness in the Far North could never have wandered so far, and in the Silurian age, when the hairy mammoth found sustenance there on its abundant vegetation, man was certainly missing. The very existence of this "country botched in the making and chucked aside unfinished," this "decaying land," this "land of shadows" was, until a little more than three hundred years ago, unknown to the geographers of Europe, except in a vague confusion with Iceland or Greenland.

2. ULTIMA THULE

The ancients had a vague idea of a land lying far to the North: they called it Ultima Thule. There is a legend that Culdee anchorites dwelt there in the eighth century, and it is said that in 795 an Irish monk, Decuiluis, had talked with re-



TOURIST HOTEL, ADVENT POINT

FIRST SIGHT OF SPITSBERGEN

ligious men dwelling in Thile or who had visited there. If one is willing to accept conjectural dates, it may be stated that the first Norsemen to see Iceland were the Faroe Viking named Nadook and his men, who in 850 or, according to other accounts, in 861, venturing westward, discovered a volcanic island and named it Sneland—Snowland.

In 864 it was circumnavigated by Swide Gardar, who called it Gardarsholm. In 866 Ravn Floke Vilgertharson, spent the winter at Bardastrand in Briedfjord. In 874 it was settled and colonized by Ingolf and Leif Ericson. The first house was built on a site at what is now Reyknavik. The colony prospered and developed a remarkable civilization and literature. In 981 Christianity was introduced and spread with great rapidity. When Iceland lost its independence in 1264 it passed under Norwegian control and so remained until 1380 when it became subject to Denmark.

Adventurers from this early Iceland were as enterprising as the Vikings of their homeland. In 986 Gunnbjørn, a Norwegian marauder, blown out of his course, had reached the rugged shores of Greenland, two hundred and sixty miles away. On his return, colonists from Iceland went there and settled. According to the Landnàmabok and the Icelandic sagas, Eric the Red, who had been guilty of murder in Norway, fled to Iceland. He was of a quarrelsome disposition, and there again was charged with the same crime. He was banished. Taking a bold crew he started forth in a small vessel and was gone three years. He returned to report his discovery of a land which he called Svalbard. It is said that there are in the Icelandic Eddas half-a-dozen references to Svalbard, but they are so meager that only circumstantial evidence decides among the various theories as to its location.

The term signifies cold border or mountain—applicable to many northern regions, to East Greenland or even to Siberia; but as the Landnàmabok, dating from the thirteenth century, declares that it was four days' sail from the north side of Iceland*, the Norwegians consider that Eric the Red was the

*"4 døgrs seilads til Svalbard nord i Havsbotn."

earliest to visit the Archipelago now generally known as Spitsbergen, and it is becoming fashionable to apply the old name to it. If Eric went to Spitsbergen, he passed by Jan Meyen Land, called then Gunnbjørn's Rocks, which is six hundred miles southwest of Spitsbergen; he is said to have named the lofty mountain Midrbjerg, or Mid Jokul, which rises to a height of ten or twelve thousand feet and from its beautiful color has been compared to "an immeasurably great amethyst"; he is believed by some to have wintered on Prince Charles's Foreland which he called after himself "Ericseya." Possibly he may have seen the great mahogany log—a whole tree—which has been a marvel to visitors for many years—lying on its bleak shore. He is also credited with having explored the inland bays and fjords of the main island and to have found them suitable for colonization.

Norwegian Explorers. There is an unconfirmed report that the remains of a viking's galley have been discovered in one of the lagoons of "Ericseya"; that would be fair proof that the Norsemen were the first explorers of that region. Moreover, certain contradictory descriptions of "Iceland" in the writings of such sixteenth century geographers as Albertus Krantseus, Jacobus Ziglerus, Johannes Frisius and others, seem to have confused Svalbard and Iceland: they speak of Iceland as if it lay in the region of month-long days and nights and were inhabited by men dwelling in "caves or hollow places in the sides of mountains," though they had houses and churches "built of the bones of fishes and whales."

The real Iceland and the real Greenland kept a continuity of history, but if Eric the Red attempted to settle his vikings on Svalbard it was as fugitive an undertaking as his son Leif Ericson's visit to the semi-mythical coast which the Saga calls Vinland.

If it be true, as Adam of Bremen reports, that Frisian galleys sailed to the North Pole in the year 1035, they must have taken advantage of the open water which from time to time allures the adventurer farther and farther toward the great ice-belt guarding those hyperborean regions and have

seen the lofty mountains along the eastern horizon. Land-looming is common in the Far North and islands below the horizon appear with lofty spires, and, owing to the extraordinary clearness of the atmosphere, land a score of miles distant looks as if it were within gun-shot.

The Voyage of Othere. King Alfred the Great, whose literary labors include the translation of the historian Orosius, incorporated in it the story of the Arctic voyage made by Othere—a native of Helgoland near Drontheim, who was the first to double the North Cape of Norway in the year 890, only eleven years before Alfred died. "Three days," says the ancient text, "was he as far north as the whale-hunters (*hoel huntan*) farthest fare." He, too, may have seen Svalbard in the distance or even landed on its shores. No one knows.

Whale-fishing must have been carried on in even earlier times for in the Older Edda the mighty Hyme is described as pulling up two whales on his hook.

Gunnar Holmsen in his brochure entitled "Spitsbergens Natur og Historie" says regarding the data vouchsafed in the Landnàmabok:—

"This information from far distant times shows a good geographical acquaintance with the situation of neighboring countries. While there can be no doubt that the inhabited lands mentioned in the Landnàmabok were visited by the Icelanders, many think that Svalbard is an imaginary land. Others believe that the world signifies 'the edge of the drift ice'; but then this does not conform with the notion of a four-days' sail. It seems absurd to argue that the Icelanders' Svalbard is anything else than Spitsbergen.

"The geographical discoveries of the vikings were generally made under stress of weather. It would be impracticable for square-rigged vessels to make headway against a storm, and equally of little use to take in sail or man the oars. The only way for small craft is to run before the wind. In such a voyage, with a southwest wind, Svalbard would be the first land seen.

"The question arises what the Icelanders were doing north

of Iceland. It is known that at that epoch trade flourished between the Northmen and the inhabitants of Bjarmeland, and that the east coast of the White Sea was investigated by men from Helgoland in the time of Ottar and of Harald Graafeld. The Icelanders took a share in these voyages. Through Ottar's report to King Alfred the Great we know that northern Norway was not occupied by the Normans, and that during the ninth century only Finns were there engaged in hunting in the mountains and fishing in the seas. Many vikings sailed around this country: for example Erik Blødexe about 920 and his son, Harald Graafeld, in 965. It is said that the latter fought with the men of Bjarmeland in the latitude of the 'Dina,' that is to say, the Dvina. Haakon Magnusson undertook a voyage in 1090. Another voyage is chronicled in 1217, and it seems that it was possible to reach Russia from Bjarmeland. . . .

"After Vardøhus was founded the intercourse between Norwegians and Russians became more lively, though not much can be said about world-trade east and west and north of the North Cape. This trade-route, in the meantime, became so well known that it gave an impulse to search for a practicable northwest passage."

GRUMANT. There is good reason also for believing that Russian hunters venturing from Siberia wandered or were driven to the shores of the Northern Archipelago quite early in the sixteenth century, possibly before 1450; these men had no bards to sing of their adventures, and the huts that they built there and the period of their visits are quite conjectural, but it is said that King Frederick II of Denmark in the third quarter of the sixteenth century tried to engage a Russian pilot to guide ships from Tromsø to Grumant. Grumant seems to be a popular Russian contraction or corruption of Grønland, Greenland; but two hundred years later Greenland was still an elastic term and connoted a good deal more than is now meant by it. The Russian word *Grumaland* is defined in Mikhelson's Dictionary of foreign words adopted into Russian as meaning "a *Promuishlennik* or Adventurer who

winters on Spitsbergen." The Russians like to call Spitsbergen by this rather ugly name.

These semi-mythical journeys to the north were as futile as Leif Ericson's voyage to America. Nothing permanent or certain came of any of them, and for hundreds of years the world of men was unaware of the existence of such islands.

Maps published about the middle of the sixteenth century depict Greenlandia or Engrøneland as a peninsula attached to a Polar continent forming a part of Asia. Some of them represented it as inhabited by Skraelinger and Pygmies with long feet. It was natural for credulous geographers, relying on indefinite legends, to imagine Greenland as much larger than it is or to believe that the unknown and semi-mythical islands north of Norway were a part of Greenland.

3. THE NORTHEAST PASSAGE TO CATHAY

During the last half of the sixteenth century repeated efforts were made to find a direct sea route to India and Cathay. It is said that Robert Thorne of Bristol, England, was the first person to suggest the possibility of a northwest passage. During the reign of King Henry VIII two small vessels, one of which bore the pious name of *Domine Nobiscum,* started forth on this valorous quest. The name of its navigators perished with the expedition.

The Muscovy Company. The Cabots, who in their search for a route to the west had discovered the continent of North America, must have been pretty well convinced that to the north there was no practicable way past it. Sebastian Cabot began to advocate an alternate route to the east and north of Europe. A company of merchant adventurers was founded, and in 1553 sent Sir Hugh Willoughby and Richard Chancellor with a fleet of three small ships to make this attempt. Willoughby in sailing above Norway discovered an island which he named New Land, which in its Russian form is Novaya Zemlya. He and the crew of two of the vessels perished in Lapland, but Chancellor got to the Dvina River and made his way to Moscow. He presented himself before

the Tsar, John the Terrible, who received him with barbaric pomp and granted his company valuable privileges, so that for a good many years trade between Russia and England flourished.

The merchant adventurers, styled by act of Parliament "the Fellowship of English Merchants for the Discovery of New Trades," was popularly known as the Muscovy Company. Its captains were instructed to keep a careful account "of the lands, tides, elements, altitude of the sun, course of the moon and stars," and to make other noteworthy observations. These reports guided the company in its speculations. Sir Clements Markham says that the publication of them by Hakluyt and Purchas stimulated colonial and maritime adventure, and inspired Shakespeare and Milton.

The Dutch traders were becoming prosperous and rivaled the British in their attempts to reach the Far East. In 1594 Balthasar Moucheron, a Flemish merchant, who had settled in Holland after the destruction of Antwerp, sent three ships and a fishing smack to try the northeast passage. Willem Barendszoon, master of the *Mercury,* was ordered to sail around the north side of Novaya Zemlya but was prevented by the ice. The next year he went as chief pilot with a fleet of seven vessels; again the ice prevented the passage across the Kara Sea. Undiscouraged the same enterprising merchant assisted by others sent up in 1596 two ships from Vlieland, near Amsterdam. Barents, as he is commonly known, was again chief pilot.

Discovery of Bear Island. On June 6, they discovered a lofty island. Sixteen men landed and got a great store of eggs. They climbed the mountain but in sliding down its precipitous side had a narrow escape from breaking their necks. On June 12, they encountered a polar bear which they killed after a battle lasting two hours. Its skin was twelve feet long. They feasted on its flesh but "brookt it not." This episode of "the Beare" gave the island its name. But it may have been visited centuries earlier and even for a time supported a colony founded by Eric the Red.

Bear Island is situated two hundred and twenty-five miles from the North Cape of Norway, and one hundred and twenty-five nautical miles from the South Cape of Spitsbergen. The latest estimate of its area are in the neighborhood of one hundred and ninety square kilometers. The northern and western part form a somewhat hilly tableland from forty to fifty meters above the sea with innumerable lakes and ponds, many of which are dry in summer. The surface consists of sandstone which by the action of the frost has been broken up into larger and smaller angular blocks, making travel exceedingly difficult. The largest of the lakes on the island is named Ella and occupies what may have been a crater of an extinct volcano.

Mount Misery on the southeast coast has three peaks known as the Three Crowns, respectively five hundred and thirty-six, four hundred and eighty-three, and four hundred and ninety-seven meters high. On the southern shore Mount Hamberg is four hundred and twenty-four meters high; others are the Alfred Mountains and the Antarctic Mountain. All of them are what the Norwegians call bird mountains. They descend precipitously into the ocean.

Barents's two small ships continued their northern voyage and on the 16th encountered the ice pack, along the edge of which they sailed eastward for forty miles or more; the next day they saw high land entirely covered with snow and stretching from west to east for many miles. They reckoned they were in latitude 80° 10′. Prevented by the ice from keeping on their course, they approached the land and spent several days rather in observations than in explorations. Toward the northern tip of the island they set up a post bearing the arms of Holland. It remained there until the English carried it off in 1612. "The land," says Barents in his log, "was for the most part broken, rather high, and consisted only of mountains and pointed hills, for which reason we gave it the name Spitsbergen."

This appellation was duly chronicled before the magistrates of Delft, the Captain Jan Corneliszoon Rijp of the

second ship explaining that it was because of the great and high points that were on it.

In the same way, commemorating natural features, Odysseus tells the Phaiakians how in his wanderings he had passed "the Pointed Isles."

Spitsbergen Claimed for Holland. On June 25, 1596, the two vessels anchored in a bay about forty miles north of Red Eric's camping-ground. They landed and found a quantity of walrus tusks; for this they called the place Teeth or Tusk Bay. In a hollow in the rocks on the shore they deposited a box containing a record of their discovery and visit, taking possession in the name of Holland.

Sailing still farther south, they gave to the precipitous point terminating "Ericseya" the name of Vogelhoek because of the immense number of gulls and other birds that flocked about it. They were unable to sail down between the Foreland and the main island by reason of a bar which Barents on his chart indicated as connecting them. This bar still presents an obstacle to navigation in the Foreland Sound and there is no marked change in the depth of the water. Keeping outside of the Foreland they remarked its beautiful outline and sharp mountainous heights. The deep bay afterwards known as Ice Fjord or Ice Sound they called Grooten Inwijk; they called the next bay below merely Inwijk; it was afterwards known as Bell Sound.

The Fate of Barents. Kept away by the ice, they found themselves on July 1 near Bear Island again. Barents and Rijp, having different views in regard to the continuation of the voyage, decided to separate. Rijp tried to take his vessel around the north of Spitsbergen but failed, and, after adventures of which little is known, turned up the following year at Kola on the White Sea.

Barents set sail for Novaya Zemlya, intending to skirt its northern coast and thus make a direct passage to the Far East. Toward the last of August the ice crushed his ship "so that it seemed to burst in a hundred pieces, which was most fearful both to see and hear." They made their way

ashore and built a commodious hut, in which they spent the winter*; drift-wood furnished them fuel; bear and fox meat gave them sustenance and checked the ravages of scurvy. When the day appeared toward the last of March they got exercise by running, walking, and playing golf. In June they embarked in two small boats for the desperate voyage back to Europe.

Barents, who was very ill with scurvy, died on June 20; two others almost immediately met the same fate. The survivors, twelve in number, all ill with scurvy managed, though deprived of their pilot, after almost incredible sufferings and a journey of sixteen hundred miles to reach Kola, where they found Jan Corneliszoon Rijp, who took them into his ship and brought them back to Holland. Dressed in their Polar garb, their caps "furred with white foxes' skins," they made a great sensation.

*The ruins of this hut, which was sixteen meters long and ten wide, were discovered in 1871 by Captain Elling Carlsen of Hammerfest.

II. NORTHERN FISHERIES

1. WHALE AND WALRUS

GERRITT DE VEER wrote a book about the expeditions of Barents and the two Captains Rijp and Heemskerk; it was translated into several languages and a reprint of the early English version, with its quaint spelling and phraseology, forms a part of the transactions of the Hakluyt Society for the year 1867. De Veer's book, and the log kept by Barents and his companions, were full of interesting particulars; yet not enough was said in them regarding the wild life of Spitsbergen to attract the attention of fishermen and whalers. Several years elapsed before this great source of profit was made known.

THE VOYAGE OF HENRY HUDSON. This important information was brought back by Henryk Hudson, whom the Dutch regarded as an Englishman and the English as a Dutchman. On May 1, 1607, Hudson, then in the employ of the English, set sail from Gravesend with ten men and a boy in the *Hopewell,* an eighty-ton craft, bound on the illusive quest for China and India. He entered in his log a note of their arrival at Spitsbergen on June 27. "The land was covered with fog, the ice lying very thick all along the shore." He must have been familiar with Barents's discovery; he may have had Barents's chart, for he mentions the northern end of the Foreland as Vogel Hooke. After cruising about for several days and reaching a latitude of 79° or 80°, he reports that William Collins, the boatswain, called from the top that he saw "the land called Newland by the Hollanders."

Can it be that the Dutch and that Hudson and his men also thought that Spitsbergen was a part of Novaya Zemlya? It was just as likely that Spitsbergen should seem to be a part

of Novaya Zemlya as of Iceland or of Greenland, as was supposed for several hundred years.

Hudson did not claim to have discovered Spitsbergen but he was impressed by the abundance of whales swimming in the bays and sounds. He told how a man of his crew "having a line overboard to try for fish" caught one of the great creatures. It gave a practical answer to Job's conundrum, "Canst thou draw out leviathan with a hook?" The whale came under the keel but got away causing "no harm but the loss of the hook and three parts of the line." It might have easily overset Hudson's tiny craft.

One can not help remarking with wonder the temerity of those early adventurers in unknown seas who trusted their lives in such cockleshells! Willian Baffin, who went up to Spitsbergen in 1613 and crossed the Atlantic, discovering the great bay that bears his name, navigated a ship of only fifty-five tons. John Davis, whose name is commemorated in Davis Strait, had vessels of fifty, of thirty-five, and of ten tons. These small craft had the advantage of being easily handled, and of being strong in proportion to their size, and therefore less likely to be crushed in the ice.

Hudson in his log gave a good description of King's Bay, which he designated as Whales' Bay. Some of his men went ashore and brought back "a pair of morses' teeth in the jaw," a quantity of whales' bones and a dozen or more antlers. This was conclusive evidence that reindeer were even then native to the island. The foot-prints of various wild beasts were noted.

A Significant Prophecy. "This land may be profitable to those that will adventure it," was Hudson's prophecy, to be abundantly verified. He reached the Thames safely on September 15, and reported to his employers, the Muscovy Company. He advised them to send ships to Spitsbergen, where skilful men might secure whalebone, seal-skins, and walrus ivory. Hudson himself entered into the employ of the Dutch, and, still eager to find the northwest passage, secured a small ship and explored the great river that bears his name and the

great bay where, deserted by his savage crew, he and his son, with a sick sailor or two, were left to perish.

Walrus. The Muscovy Company was already receiving oil and ivory from Bear Island, which Steven Bennet pretended to have discovered in 1603, naming it Cherry Island. He brought home a report of the walruses abounding there and a considerable number of tusks from such as they could kill. It seemed strange to them he said, "to see such a multitude of monsters of the sea lie like hogs upon heaps" and "making an horrible noise and roaring." In 1605 Bennet went to Bear Island again, and boiled down eleven tuns of oil. Commemorating various accidents that occurred they named the mountain at the south end of the island Mount Misery, and having got two foxes near the high mountain to the southeast, J. Poole, who was of the company, called it "Mount Maleperdus," alluding to the name in the merry book of "Reinold the Fox." The next year the same crew killed six or seven hundred walruses from which they made twenty-two tuns of oil and filled three hogsheads with ivory. The logs mention the discovery of lead ore and quantities of coal which burned well. In 1609, two "interlopers" from Hull followed the Muscovy Company's ships up to Bear Island and one of them, Thomas Marmaduke, in the *Heartsease,* made an independent expedition to the north and "discovered" Spitsbergen on his own account.

Almost every summer for ten years he was engaged in killing walruses and making explorations to the north and east. On his ship, the *Hopewell,* he brought home the crews of shipwrecked vessels belonging to the Muscovy Company which took him into its service. He discovered and named several islands belonging to the archipelago.

Discovery of Sea-Coales. In 1610 Jonas Poole, in the seventy-ton *Amitie,* discovered and named Bell Sound, Ice Sound and Green Haven or Harbor, and affixed names to many other bays and harbors as well as to mountains and points. His quaint and often amusing narrative has been published and may be read in "Purchas his Pilgrimes." He made a

hunting expedition into King's Bay, and discovered "Sea-coales, which burnt very well."*

He arrived in London on August 1, with a cargo of one hundred and twenty walruses, fifty-one reindeer, thirty bears, the horn of a narwhal or sea-unicorn, and a quantity of whalebone or baleen which he called "Whales' Fins," picked up on the shore, the relics of stranded cetaceans. At the present price of whalebone—ten or twelve thousand dollars a ton—that alone would have been a fortune; but it was valuable then: women wore stays.

Basque Whalers. The following year Poole was sent as pilot to conduct two of the Muscovy Company's ships to Spitsbergen—to kill "a whale or two or three" for practice, and to make further discoveries, the company being desirous of finding whether Spitsbergen was "an island or a main, and whether it trended to the east or to the west of the Pole, and whether it was inhabited." On the larger of the two vessels, the *Mary Margaret,* sailed six Basques—"men of San Juan de Luz"—famous for their skill in the whale-fishery, and the English sailors were instructed to take notice and learn of them. Coppers and other apparatus were taken for the purpose of boiling the blubber. The first whale known to have been killed on Spitsbergen yielded twelve tuns of oil. But the *Mary Margaret* was driven ashore by the ice and sunk. The crew, abandoning the blubber of five hundred walruses which they had been engaged in boiling, started out in five shallops to make Bear Island. Thirty of the men reached their destination in safety, and found Poole, who, in his little fifty-ton *Elizabeth,* had been making explorations and had killed two hundred walruses in one day. Marmaduke picked up the rest and went to save what could be saved from the wreck. Poole gives a lively description of the loss of his own

*The coal-strata on Bear Island are found in the northern portion but their extent and value as fuel have not been definitely determined and the reports regarding them are contradictory. Owing to the lack of convenient harbors, it will probably be long before they will prove to be commercially available.

little ship, due to overloading, his narrow escape from death, and the return to Hull, ninety-nine of his men packed into any one tiny vessel, "well in body, but much distrest and impaired in their states."

This was the rather inauspicious beginning of the fisheries of Spitsbergen, which for many years provided excitement and profit for the Muscovy Company and its numerous rivals. Whales at that time and for many years used to frequent the bays in schools of several hundred "to gender, feed, and rub themselves." The proprietors of the Muscovy Company had the backing of the King and of Parliament in its attempt to maintain a close monopoly; but "interlopers" from Hull were constantly appearing in Spitsbergen waters, the whale oil especially, which was extensively used in the manufacture of fine soap, used in laundering the immense ruffs and dainty laces of the fashionable world, making the fishery profitable. The Dutch also were not behindhand in their exploitation of the traffic. The history of the often strained and complicated relations would in itself make a volume, since from the very beginning manuscript and published accounts of the company's servants and of the interloping whalers furnish almost a daily diary from opposite standpoints.

Fotherby's Narration. In the library of the American Antiquarian Society of Worcester, Massachusetts, is a manuscript giving the "Narrative of a Voyage to Spitsbergen in the Year 1613, at the Charge of the Fellowship of English Merchants for the Discovery of New Trades, Commonly Called the Muscovy Company with a Description of the Country and the Operations of the Whale-fishery." It was probably written by Robert Fotherby. The folios have wide margins, and are carefully stitched into a thick parchment cover. It belonged to Deacon James Green of Boston, whose daughter, Mrs. Nabby Richmond, gave it to B. R. Howland, President of the Rhode Island Historical Society in 1808. He gave it in turn to the Antiquarian Society. Fifty copies were privately printed in Boston in 1860. It is illustrated with water-color pictures, one of them representing peaked mountains like a profile of

six persons, and depicting five reindeer on the snow with bears and foxes in comical postures. This account is one of the most interesting documents on the subject, beginning with its vivid description of the whale, which it says "is a fish or sea-beast of a huge bignesse about sixty feet long and eighteen feet thick."

The English and the Dutch, both assisted by Basque experts, had many hostile encounters. For a time it was a regular war, the fleets being convoyed by armed vessels. Just as London and Hull sent out rival expeditions, so did the principal Dutch cities—Amsterdam, Zaardam, Rotterdam and Delft; but in order to contend more effectively with the English these Dutch venturers coalesced into a single corporation called the Noordsche Compagnie which was also granted a monopoly by the States General.

English Annexation of Spitsbergen. The Muscovy Company retaliated by using the authority of Parliament formally to annex Spitsbergen, "by right of prior discovery." They took possession with elaborate ceremonies, setting up the King's Arms as symbol and proof. When they found Dutch "boileries" on the shore, they confiscated them; when they met Dutch ships they seized blubber, oil, and equipment. Thus one of the London adventurers in 1617 boasted of having taken from the Flushing ship named the *Noah's Ark* two hundred hogsheads of blubber, two whales and a half, a great copper, and "divers other provisions," and sent it away ballasted with stones. The Dutch built a wooden "hut," eighty feet long by fifty wide at Bell Sound; the English came along, tore it down, and set it up in another place for their own use.

When, as generally happened, the Dutch were more numerout or were accompanied by a better-armed convoy than the English, these high-handed acts were reciprocated. The Dutch set up Prince Maurice's arms near where Fotherby had posted the British claim. In 1618 the Dutch burned the English house at Horn Sound, split their shallops, as whale boats were then called, and heaved their oil casks into the sea. The Dutch also despoiled three of the Muscovy Company's vessels, all

these depredations causing a loss claimed by the English of more than sixty-six thousand pounds.

Such lawless acts were provocative of formal war, but neither company wanted war. The Dutch sent commissioners to London to settle such disputes. A trial court decreed that the Dutch should return the stolen goods within three months or make a payment of twenty-two thousand pounds. On the other hand it was recognized that the Muscovy Company's men had been guilty of similar transgressions and must make restitution for property, even though it were "taken by His Majesty's warrant and authority." Payment was made by neither side. The Muscovy Company, disgusted with its losses, sold its whaling rights to four of its partners, who for many years continued to send ships to Spitsbergen, expending as much as fifty or sixty thousand pounds a year, and getting very variable returns.

Sir Martin Conway attributes the feeble backing of the British Government in these controversies to the sad condition into which the navy had been allowed to lapse. Annexation had been proclaimed but no serious attempt was made to enforce it. Sir John Merrick, British Ambassador to the Court of the new Tsar, Mikhaïl Romanof, secured a license to engage a number of Laplanders—"a people living in a very cold climate and a barren soil"—to be transported there, but nothing came of it. The British Government permitted the London Company to offer some criminals condemned to death a pardon and a generous compensation provided they would spend a whole year on the north coast of Spitsbergen. But these men, when faced with the horror of being left alone, "preferred to return and be hanged rather than stay on those desolate shores." It is said that they were never executed.

Danish Claim of Sovereignty. Claim to sovereignty over Spitsbergen by England was not to go without protest. The Danes were beginning to send up ships and the King of Denmark, which then included Norway, announced that, as a part of Greenland, it belonged to him. King James seems to have acknowledged this right and dropped his plan of an-

nexation. Then the London Company and the Dutch Noordsche Company, which had considerably enlarged its membership by admitting the whale-fishers of several Netherland cities, found it expedient to come to an agreement, so as to make common cause against the Danes, the Basques, the French, and other "interlopers."

It was more like an armed truce: every little while new conflicts broke out, but as a rule the Dutch and the Danes confined themselves to the northern bays, while the English occupied those to the south of what is called Danes Island. They all united against the Basques, who, with a French company, finding themselves outnumbered and being more skilful, took to the deep-sea fishery and boiled the oil on board their vessels.

Smeerenburg or Blubbertown. The Dutch whale fishers selected as a convenient station for their "boileries" the rather flat point of Amsterdam Island. This was on the southeast side. At first the representatives of only two cities, Amsterdam and Delft, located there; as other Chambers joined the Noordsche Company the "tents" extended along the shore until there was no more room. It became a large summer settlement with solidly-constructed "coppers" for boiling the blubber, work-shops for the coopers, store-houses for such of the finished products as could not be carried home during the season, and quarters for the shore men engaged in flensing the whales, and in other operations connected with the industry. As it was customary for each ship to bring double crews of sixty, seventy, or eighty men, and a considerable fleet came up from Amsterdam, from Delft and half a dozen other Dutch cities, the settlement assumed some importance. There was a bakery where a horn was sounded every morning to announce that hot rolls were ready; there were shops for the sale of tobacco and strong drinks. There was a church. For protection against the Danes a fort was built and cannon frowned ominously from its embrasures. Questionable characters flocked there and among them women were occasionally seen. The place came to be known as Smeerenburg, which means

Blubbertown or Oil City. In its hey-dey, up to the middle of the seventeenth century, it had a population conservatively reckoned at twelve hundred, but in popular exaggeration at twelve or even twenty thousand.

It was the scene of many tragedies. Hundreds died violent deaths or perished from the inevitable hardships. The dead were buried on a neighboring island called by the Norwegians Dødsmandsøren—corrupted by the English into Deadmen's Ears, or, with the Nerwegian definite article tacked on at the end, Dødmanden, similarly transmogrified into Dead Man's Den!

2. OVERWINTERING ON SPITSBERGEN

Fate of Men Left on the Island. Whaling and walrus hunting were summer industries. Ships, as soon as they were laden with the oil and tusks of ivory, returned to the south before winter and the Arctic night caught them in the grip of the ice. No men would have voluntarily spent the long, gloomy months in that desolate land; yet many must have been accidentally left there and perished, leaving no record of their sufferings. The English Captain Mason, sailing for the London Company, and author of a book about the whale fishery, was charged with having deserted nine men, "who all died miserably upon the place, being cruelly disfigured after their deaths by the savage bears and hungry foxes which are not only the civilest but also the only inhabitants of that comfortless country."

The First Overwintering. In 1630, the same captain, in command of the ship *Salutation,* sent eight men on an expedition to kill reindeer. It was August 15 when they set out; the weather was fair and clear, but fog soon cut them off from sight of the ship. They had with them a brace of dogs, a snaphaunce or musket, two lances, and a tinder box, but no compass.

They hunted along the shores of the Foreland and got "fourteen tall and nimble deer." They made desperate efforts to reach the ship but missed it both at Green Harbor and

at Bell Sound. She had sailed with the rest of the fleet. They were obliged to spend the winter on the island. They were of the same stern stuff as the Pilgrim Fathers: had they been willing to work on Sunday they would not have lost a day and would have got safely with their store of fresh meat to Bell Sound.

When they found themselves deserted they were at first full of despair and "stood like men already metamorphosed into ice, with the eyes of pity beholding one another." But soon they shook off "all childish and effeminate fears" and prepared to make the best of it. They built an almost air-tight house inside of the great "tent" at Bell Sound and collected as much fuel as possible, being very scrupulous not to destroy any serviceable property belonging to the "worshipful company" whose servants they were. They divided the food into rations and kept two days a week as fast days. As they were provided with fresh meat and got plenty of exercise they did not suffer from scurvy. When the first ships from England appeared, on May 25, the men came out of the tent, with hands and faces begrimed with smoke and with clothes tattered with wearing, but all well, though "pale, leaned and ill-colored." The first ships to arrive were from Hull. Interlopers are almost always more enterprising than those that think that they possess a monopoly. Though rivals they met one another with friendly greetings. The London men invited the new-comers into the tent and "showed them the courtesy of the house, giving them such victuals as they had, which was venison roasted four months before, and a cup of cold water, which for novelty sake they kindly accepted."

Three days later ships of their own company came in and "the right noble Captain William Goodler, the chief commander of the fleet, joyfully received them, gave orders that they should have anything in the ship that might do them good and increase their strength, and at his own charges furnished them with apparel to the value of twenty pounds. Four of them elected to return to Captain Mason's ship, "thinking to be as kindly welcomed as the lost prodigal after

their enduring of so much misery which through his means partly they had undergone . . . no sooner came they aboard his ship but he most unkindly called them runaways with other harsh and unchristian terms, far enough from the civility of an honest man."

One of the eight, Edward Pelham, a gunner's mate, "faithfully reported" the experiences of the winter, in a narration entitled "God's Power and Providence shewed in the Miraculous Preservation and Deliverance of eight Englishmen left by mischance in Green-land Anno 1630 nine moneths and twelve days." It was published the following year. Sir Martin Conway cites many of its dramatic and memorable passages in his "No Man's Land." The quaint naïve simplicity of the style and the fine spirit shown by the men in overcoming all difficulties—their devices for ensuring comparative comfort, their battles with bears, their clever trapping of foxes and snaring of birds—make it as interesting as Robinson Crusoe. Pelham thus tells of their home-coming, which was delayed until the last of August:—"Embarked with joyful hearts we set sail through the foaming ocean, and though crossed sometimes with contrary winds homeward bound, yet our proper ships at last came safely to an anchor in the River of Thames, to our great joy and comfort and the Merchants' benefit. And thus by the blessing of God came we all eight of us well home, safe and sound; where the Worshipful Company, our Masters, the Muscovy Merchants, have since dealt wonderfully well by us. For all which most merciful Preservation and most wonderfully powerful Deliverance, all honor, praise and glory be unto the great God, the sole Author of it."

The First Dutch Overwintering. This was, probably the first published account of an overwintering on Spitsbergen—at least since the semi-mythical sojourn of Eric the Red on the shores of Svalbard, more than seven hundred years earlier. The story of Pelham and his comrades became widely known and served to dispel the fear of spending the winter season on Spitsbergen. In 1632 Braem, the Dane, with a crew of Basque whalers, fell on the Dutch station on Jan

Mayen, then known as Mauritius Island, and looted it. The "Ed. Heeren van de Groenlantsche-Compagnie," had too much property at stake to risk further depredations, and persuaded seven men to stay at Jan Mayen and seven at Smeerenburg. Those left on Jan Mayen all died of scurvy. The other seven survived.

THE FAMOUS DIARIES. Both parties kept diaries. The one written by Jacob Seegerszoon van der Brugge, of the Spitsbergen crew, shows that they were like Pelham and his companions, of pious and sturdy stock. He tells how they resolved to sing a psalm and engage in worship every morning and evening; how they collected all the fresh food they could get, and maintained a watch day and night, with the design, in case marauders from Biscay or elsewhere appeared, of lighting fires in all the "tents", making smoke arise from all the chimneys, flying their flags, firing shots from the fort, and creating as much noise as possible so as to deceive the enemy into the belief that the place was fully manned. They kept off scurvy by securing the flesh of reindeer, bears and ducks, and by securing plenty of scurvy-grass. When relieved in the spring they were in excellent condition and had collected many valuable furs, some walrus ivory and whalebone. But their attempts to catch whales were futile. One which they towed for twelve hours broke loose in a tempest and was lost.

Seven men were left also in 1634, but they depended more on Providence than on themselves, and all died of scurvy before the end of February. One of their number kept a sort of journal, relating their experiences. This was found when the following summer the annual visit of the whaling fleet brought a landing party which broke its way into their shack called "de Tent van Middelburgh," and became aware of the grim tragedy. Portions of the dog which they had been obliged to kill for food were still hanging in the loft; three of the men were in coffins—"stonden in kisten,"—two of the other four were dead in their bunks, two on the floor.

THE LOG OF THE SEVEN SAILORS. A few years later Gillis Joosten Saeghman, who called himself Printer-in-ordi-

nary of the Journals of Sea and Land Journeys, issued from his printing house in the Nieuwe-straet, t'Amsterdam, a small quarto volume, the last three pages of which contained his annoyingly condensed restatement of the log of the seven sailors. The book is printed in double columns in black-letter, and is adorned with quaint woodcuts, one of which depicts a three-masted ship which looks as if it were sailing stern-end first. There is a boom with a small three-striped flag on a stick standing perpendicularly; a much larger one adorns a staff at the stern, which is twice as high as the bow; the three masts have flags of different sizes; none of the crew is visible, and it looks like a derelict drifting backward before a strong wind which bellies the four square sails. Those on the mizzen-mast are furled. Another smaller cut represents a great battle between three of the "Matroosen," and an enormous bear standing on his hind legs and looking as benevolent as a pious parson, with his fore-paws extended as if in giving a benediction.

They saw the last ships depart on September 11. At first they tried to capture some of the many whales in the bay, but fortune did not favor them; they hunted for reindeer and hare, but there were none of these in their vicinity, and no green herb could be found. They had the last glimpse of the sun on October 20 or 21, O. S. About a month later the first symptoms of scurvy began to appear and they redoubled their efforts to get fresh meat, but in vain; yet they encouraged one another to hope that God would show them greens and fresh meat, and that they would be provided for. Then came the encounter with the bear. The text for the two days, December 23 and 24, says:—

"They saw the first bear/as the cook poured water out. He stood before the window/but hearing a noise he departed on the run. The 24th ditto they saw another bear and then three of them ran out to meet him/when they were about to attack him/he stood up on his hind legs and threatened them very angrily/but when he was hit by a musket ball in his body he began to bleed and to whine/With his teeth he bit

into pieces one of the halberds and then started to run away/ They followed him with two lances but were unable to capture him, however much need they had of him in order to eat him up as a specific against their sickness, for not one of them was free from pain. These were their words:/"If things do not improve, we shall all be dead before the ships arrive, for God knows what we need.' "

The first of them to die was Adriaen Thijsz of Rotterdam. This was early in January, and was followed within three days by two others, one of them being Cornelis Thijsz, *op welche sy haer meeste hoop wel gestelt/naest Godt*—"in whom they had placed most hope next to God." For these three the others had still strength enough, though very sick and full of pain, to construct *kisten* or coffins.

On January 28 they saw their first fox but were unable to catch or kill him. The next day they killed one of the two dogs—the red Flushing—*haer roode Vliesinger Hont*—and ate some of the meat—literally "hot dog." Bears became more numerous; sometimes ten or a dozen came around their shack at once, "but they had not the strength to shoot at them and even if they had hit one they could not have gone to him as they could not place one foot before another, nor could they even bite bread." They managed, however, to catch a hare, "which pleased them much but was of little help." The strongest of them, Jeroen Carcoen of Delft-Haven, collected a little coal and kept the fire going.

On the 23rd they were flat on their backs and "gave up into God's hands." The following day the sun first made its appearance and "they praised God for it." On the 26th the last entry was made. "The four of us who are still alive, are lying flat on our backs—'plat de Kop'; we could well eat, if only one of us were strong enough to get up so as to lay the fire/We can not move because of our pain/We pray God with folded hands that he will release us from this troubled world/As it pleaseth Him we are ready/since we can not longer exist without food or fire/and we cannot help one another/Each one of us must bear his own burden."

The bodies of the seven sailors were at first buried in the snow, but later, when the bare ground began to appear, they were probably removed to the regular cemetery and placed in graves covered with rocks, "so that they could not be disinterred and torn by wild beasts." The record ends: "After that no more folk were left on Spitsbergen." The three different journals were often republished and were translated into English and other languages.

3. THE END OF SMEERENBURG

When the Dutch took to open sea whale-fishing, and found it no longer profitable to tow the whales to harbor for flensing, most of the boileries at Smeerenburg were dismantled, and the coppers and other valuable apparatus were taken back to Holland. Deserted buildings quickly fall into ruins. Irresponsible persons, filled with the spirit of destruction, find a savage pleasure in breaking in doors or setting fires. Within a few years little was left to show what had once been there.

Dr. Martens's Account of Spitsbergen. In the summer of 1671 Friedrich Martens went up to Spitsbergen as ship's surgeon. He kept a careful diary of what he saw and did, illustrating it with quaint and curious sketches. When he returned to Hamburg he brought with him the first samples of plants from the islands. His observations were published first in Hamburg in 1675, were translated into Italian in 1680, into Dutch in 1685, into English in 1694, and appear in a French translation in the second volume of a "Collection de Voyages," published in Amsterdam in 1732 but without the author's name. The plates illustrating it are amusing. The first shows five three-masted vessels engaged off Prince George's Foreland in the various operations of harpooning, towing and flensing whales. The second depicts two similar ships crushed in the ice, one of them suffering the loss of the mizzen-mast which is falling over a high peak of an iceberg. Enormous sailors, each as big as the boats in which they are trying to escape, are also engaged in the ice. In the foreground several bears, and a fox as big as a bear, are looking on with ill-concealed

glee. Four birds are perched or lighting on what may be the back of a whale or else a reef. The third shows the entrance to le Havre du Sud (Zuid Hawen). In the foreground are three three-masters and farther in, near a smoke which evidently rises from a "cookery," are several others diminished to mere specks, while on both sides rise tremendous mountains with glaciers descending from their summits.

Dr. Martens visited and described Smeerenburg. He tells how the houses built by the Dutch were every year falling into ruin and burnt down, though still there were enough of them standing to resemble a village. On the opposite shore stood the cookery of Harlingen (Cuisine de Harlem!):—

"There still remained four houses, two of which were for stores; the other two had served as dwellings. The houses were not very large; in the front part there was a stove, and in the rear a chamber occupied the whole width of the house. The store-houses were rather larger: there we found *kardels* or hogsheads, some of which were headless; others had gone all to pieces and nothing was left but a single piece of ice shaped like the kardel in which it had been. We found an anvil, tongs and other tools for making either the kardels or for melting the blubber. These tools were firmly imbedded in the ice. The cookery was in exactly the same state as when it was left; the wooden troughs were near by."

He speaks of visiting the places where the dead had been buried. "Bodies," he says, "do not decay or fall into dust in this country: this was proved by a corpse which we found there and which had been buried ten years before. There was no change either in the face or in the clothes. The cross erected over the grave gave the date when the burial took place."

Within a few years nothing remained to show that an extensive settlement had been in that region except the marks made by the foundations and the extensive grave-yards.

Nearly all accounts of Spitsbergen dwell with a sort of fascinated awe on the grim evidences of tragic deaths all along these shores: the remains of crosses once marking graves, the weathered splinters of coffins, the skulls and bones of human

beings scattered in all directions. Martens in his account spoke of the way in which white bears found and devoured the bodies even though they were "well-covered over with great rocks." The graveyards contained from a hundred to several thousand remains, but isolated graves are to be found. A typical example of the gruesome sights which one may still come upon is afforded by Geheimer Regierungsrat Professor Dr. A. Miethe, who accompanied Prince Heinrich of Prussia and Count Zeppelin in the famous expedition of the *Mainz* in 1910. He made an expedition into the farther reaches of Magdalena Bay. He and his party landed on a peninsula jutting out among icebergs.

Professor Miethe's Description. "This low peninsula," he says, "which is connected with the southern shore of Magdalena Bay merely by a narrow sandy ledge, is designated on the map as a cemetery. Across the broad beach where we had drawn up our row-boat, we slowly ascended to the flat rocky slope of the peninsula. On the shore the scattered bones of numerous men and Polar bears were bleaching; but above, on the height, among the rocks a horrible yet wonderful sight awaited us. Rows and rows of graves had been laid out there. Amidst the boulders and the moss-overgrown hollows lie, in long rows, the ruins of innumerable graves. Everywhere are the remains of coffins, the plain boards of which frequently are thrust above the rocks, and in the open boxes lie well-preserved skeletons and bones, the age of which it is impossible to know. Many are overgrown with moss and parti-colored lichens; others are bleached and polished by sun and rain, wind and snow. An immense field of death on which hundreds rest from the struggle!

"All these graves lie there open. It almost seems as if the lower part of the coffins, with their boards fallen apart, the nails long since rusted away leaving behind only brown marks on the faded wood, had never had covers. Only here and there a few huge, whitish boulders, thickly overgrown with velvety-black lichens, are laid upon the tombs, revealing by their fresh, sharp corners that they were expressly broken for

this purpose. And between the stones and along the weather-beaten boards creeps the red-flowered saxifrage, and the dwarf Polar willow covers the hollows with dark green polished leaves and clings to the pale yellow disintegrating lichens.

"Not a cross or a mark anywhere save at one place is a kind of mound piled up, with a broken plank stuck into it; a bulging golden-green pillow of moss covers it with a low roof just as in Germany ivy is sometimes found twining over some deserted sunken grave.

"On the summit of the little hill stands a solitary gray block of stone with a pile of broken rocks made into the semblance of a little pyramid. Pushed up close to the boulder is an open wooden coffin where lies a dead man who seems to have been placed there with especial solicitude, and near by is a half-buried beam which once bore an inscription; it is now entirely obliterated. Next the remarkably narrow white skull and the moss-covered spinal column glitter the fragments of a bulgy-bellied green bottle. Here in this bottle the survivors deposited the story of those that died together on this frozen shore, and this must have been the tomb of their leader.

"Who could the dead men have been, laid out here peacefully reposing side by side in their last sleep? What brought them hither to this outermost limit of the round world? Were hunger and scurvy, bitter cold and wretchedness the cause of their perishing far from home and country, far from their wives and children? Did the ice-floes crush their ship in the icy waves while the unfortunate crew reached shore with little besides their bare lives? Or did death come to them through conflict and hatred, covetousness and mad craze for gain and the fight for existence waged with deadly weapons in this savage outpost of the world?

"The history of Spitsbergen gives no certain information. Probably they were Englishmen who engaged in conflict with the Dutch regarding the whale fishery. Hundreds of them perished in this struggle and were buried by the survivors.

"So it may have been here, and a tragic leaf from the chronicle of humanity lies exposed before our eyes. Spitz-

bergen's history and exploitation make a gloomy chapter, a document of man's shortsightedness, avarice, and bestially savage predatoriness. As the weasel, sneaking into the hen-yard, is not satisfied until the last living fowl becomes the victim of its blood-thirstiness, so has man senselessly and aimlessly wasted the treasures that generous Mother Nature herself gave him here in the night and amid the Polar ice. Where are the schools of whales, where are the thousands of seals which used to bask in the sun on the icepack, where are the reindeer which thronged the tundra? What has become of the primitive walrus which peacefully inhabited this lonely coast, and where has vanished the king of this realm, the white Polar bear?

"Man, in his insensate lust of destruction, has made way with them all or driven them off into the inaccessible regions of the Far East."

Dr. Miethe ends his narration with this fine passage:—

"Nature has shrouded with a mantle of beauty the atrocities of men: indeed it is a wonderfully impressive grave-yard. Blue and calm the level fjord stretches away toward the mountain background, and the ragged peaks that force themselves up through the many-armed stream of the mighty glacier are reflected in the mirror-like lagoons on the shore. The solemn silence of the tremendous panorama is broken only by the voices which in muffled roars betray the ever-active life in the depths of the giant glaciers above, or by a cannon-like thunder-crash when from their brows fall detached fragments to float away from their feet."

Many more ships, and of course many more fishermen, went up from the Netherlands than from England; but that does not explain why, with the exception of those found on the low cape near Magdalena Bay, there are almost no mortuary relics of the London and Hull men that lost their lives on the shores of Spitsbergen. Might it not be that the English took the bodies back to England instead of burying them in such cemeteries as the Dutch constructed? Sir Martin Conway, in his books on Spitsbergen, cites several tragic

occurrences where Englishmen were killed or drowned, and of course it is possible that among the almost innumerable graves, whose identity it is impossible to fix, there were many left, as Dr. Martens intimated, to be "found and devoured by the hungry bears."

In 1818 a thousand graves were counted on Amsterdam Island; in other cemeteries there were almost as many. On the northern extremity of one of the two islands known as the Norways, two hundred and forty-three graves were discovered about the same time. Such inscriptions as were legible were in Dutch. In 1684 two hundred and forty-six whaling ships went up from the Netherlands. In 1878 the Dutch cruiser *Willem Barents* put into the harbor at Smeerenburg, where there were still to be seen the remains of circular walls of ancient cookeries, broken red tiles, oars, bits of cable, and the huge bones of whales. At the burying ground the crosses were fallen; skulls and bones were scattered about. Inscriptions dating back as far as 1742 were barely legible. The officers and men built a cairn, and a stone brought from Holland was placed against it. It bore the inscription:

IN MEMORIAM
SPITSBERGEN OR NIEU LAND OUTDECKT
TOT 79° 20′ 30″ N. BREEDTE
DOOR DE HOLLANDERS
HIER OVERWINTERDEN 1633-1634
JACOB SEEGERSZ
EN ZES ANDEREN
HIER OVERWINTERDEN
EN STIERVEN 1634-1635
ANDRIES JANSZ
VAN MIDDELBURG
EN ZES ANDEREN

Dr. Hergesell, who copied the inscription, gives the name of Andries Janszoon as Andries Jacesz, and spells and arranges the words in a slightly different way from that given by Jules Leclerq, who visited there on the Finnish cruiser *Oihonna* and published his experiences in 1904.

The Queen's Memorial. When Dr. Professor Hergesell was there for the first time in 1906 extensive cemeteries were still visible, but that year the Dutch cruiser *Friesland* was sent up by the Government to put into proper order the neglected remains of the early adventurers. All the bones found in and around the graves on Deadman's Island and on Amsterdam Island were carefully collected and placed together in a tumulus, or what the Germans call a *Hünengrab,* on the point of the peninsula where it is visible for a considerable distance. The stone bearing the former inscription was removed from the site of Smeerenburg, and set up again with a new plate with these words engraved on it:

HR FRIESLAND MS
HERSTELDE
DESE GRAVEN
EN 1906 OPLAST
VAN DE KONINGEN
DER NEDERLANDEN

While the *Friesland* was engaged in this pious task its crew had the good fortune to rescue a French tourist-ship with four or five hundred passengers on board from a terrible disaster. Lured on by remarkably favorable ice conditions and weather, her captain took her into regions above the eightieth parallel of latitude, and ran her on a sunken rock at the entrance to Foul Bay. When the tide went down she listed dangerously. Had a sudden storm arisen or dense fog prevented their plight from being discovered a dreadful tragedy would have ensued. Even if those that were landed together with fifty tons of coal, in order to lighten the ship, had been saved from drowning, it is unlikely that they could have survived the winter.

Fortunately several small craft were in the vicinity and the *Friesland* came up and at high tide succeeded in pulling the ship off.

Dangers of Navigation. There are on Spitsbergen immense quantities of magnetic rock which exert a powerful

RUINS OF SHIPWRECKED HUNTERS' HUT

GRAVES AT ADVENT POINT

influence on the compass, and make it untrustworthy. Although many soundings have been made, and considerable acquaintance has been gained of the great Spitsbergen Bank which extends up from Bear Island, yet the maps and charts hitherto available are not regarded as perfectly safe guides, and ship captains are instructed to throw the lead continually as they approach the coast. There are still many reefs and rocky points which make the navigation of these waters perilous. Sudden storms and abrupt changes of the wind occur by reason of icebergs and icefloes. In pleasant weather the extraordinary clearness of the atmosphere often deceives the inexperienced navigator. Sometimes the higher peaks are visible from a distance of fifty sea miles.

In 1912 Captain Vollrath on the yacht *Senta* detected Hedgehog Mountain (Hornsund Tind) at a distance of ninety nautical miles. It is thirteen hundred and ninety meters, about four thousand, five hundred and sixty feet in height. Ships have been known to lower boats when twenty miles away, under the impression that they were within easy rowing distance of the coast.

Violent tidal currents in some parts of the Archipelago also render navigation perilous. There seem to be great variations in the height to which the tide rises in different parts of Spitsbergen. It reaches two and two-tenths meters in Schoonhaven or Recherche Bay, with an average of one and six-tenths. In Advent Bay the spring tide averages one and eight-tenths with a current of one and a quarter nautical miles an hour. In the north, at the mouth of Redbeach Point between Wiche Sound and Wijde Bay (Sir Thomas Smith Inlet), there is a rise of two and a half meters or more. In Treurenberg Bay, which averages from fifty-five to ninety meters in depth, it is rather less than in Advent Bay. In Helis Sound, called Hell Sound by Lamont in 1869 when he sailed down the southeast coast of West Spitsbergen, he met with a terrific tidal current which he estimated to run at the rate of eight knots an hour. When it was traversed by Captain Rüdiger on the German fishing steamer *Helgoland* in 1898, it was noticed that this current

was characterized by powerful whirlpools which would be likely to "make the crew feel their hair stand on end and resolve never to try it again if once they got safely through." It is safe and practicable only at slack of the tide.

The Profits of Whale-Fishing. During the golden period of the whale-fishery, the annual profits to the countries engaged in it, at first in the bays and fjords of Spitsbergen, and in the open sea after the whales were becoming "shy of the cookeries and anchorages of the ships, shallops, and what pertained to them," were very large, though naturally the enterprise must have been exceedingly precarious with fluctuating returns. In 1697 Hamburg and Dutch men-of-war convoyed a fleet of more than two hundred Netherland and North German whalers. For two centuries after that whale-fishing in the Far North was profitable. Georg Wegener, in his book "Zum ewigen Eise," published in 1897, estimated that between 1669 and 1778 fourteen thousand, one hundred and sixty-seven Dutch vessels visited Spitsbergen and captured fifty thousand, five hundred and ninety whales, the oil and whalebone of which was worth ninety-two million, seven hundred and seventy-five thousand francs. As an example of the variation in prices it may be noted that as early as 1618 an Englishman plying his trade as an ivory turner in Amsterdam invented a process for compressing whalebone under heat into a black mass resembling horn or jet, and used so much of it for looking-glass-frames, sideboards, mantelpieces, knife-handles and medallions, that it doubled the price and the States General, in recognition of his services, conferred on him a pension for ten years.

Sir Martin Conway attributes to the great quantities of train-oil brought into England by the London Company's ships, by the Hull and Yarmouth interlopers, and also smuggled in from France and Holland and used largely in the manufacture of a fine quality of soft soap, the immense development in laces and ruffs which marked the costume of the wealthy at this period of the seventeenth century.

Interesting as the history of the whale-fishery is, filled as

it is with exciting adventures, its importance to Spitsbergen practically ends with the disappearance of the whales from the harbors and bays of the west coast. If the whalers had been less rapacious there would have been plenty of whales for all normal use, for the abundance of the food which those enormous creatures feed upon was beyond calculation. It is described as consisting of semi-transparent globules from a twentieth to a thirtieth of an inch in diameter and other varieties like hairs all forming masses cubic miles in extent and with some 23,888,000,000,000,000 to the cubic mile. The so-called whalebone serves as a strainer to keep in the food while allowing the green water, in which these almost microscopic creatures flourish, to escape. These little animals all bear long Latin names and the items of a cetation dinner read like the bill-of-fare of a Feast of Lucullus.

Whales and Cod-Fishing. In 1868 Sven Foyn invented the explosive harpoon and this led to an active pursuit of the finner whale by the Norwegians. The men engaged in cod-fishing cherished the theory that the finner whale fed on the capelan or salt-water salmon, which they believed drove the cod toward the shore and within reach of their boats. The Norwegian Government caused this theory to be investigated, and decided it was not correct. But in 1903 the cod-fishermen made an attack on a whaling station near the North Cape, and as a result whaling was forbidden in the waters of northern Norway.*

The result was that a number of whaling-companies established stations or floating factories in the very harbors on Spitsbergen where the Dutch, the English, and the Danes had once worked in desperate rivalry. The first year, 1905, great success was reported; sixteen vessels caught about six hundred whales, producing nearly twelve hundred barrels of oil. But this figure was not maintained. In 1912 only two companies were represented, and the fifty-five whales caught produced eight hundred fewer barrels than were obtained in 1905. That figure may be contrasted with the one thousand, nine hundred

* See page 207.

and sixty-eight whales brought down by one hundred and twenty-nine Dutch and seventy-two German whalers in 1697, when the value of the blubber and whalebone was estimated at three hundred and seventy-eight thousand, four hundred and forty-nine pounds sterling—equivalent to several millions of dollars in modern money.

III. ARCTIC ADVENTURERS

1. EARLY COAST EXPLORATIONS

DURING the long period of the Spitzbergen whale fishery exploration was encouraged, certainly by the London Company, but the results were largely kept secret. The chief interest was confined to the edges, the circumference, of such new lands as were discovered or exploited: harbors safe for anchorage and bays frequented by whales and walruses were the chief desiderata.

Coal and Gold. For this reason comparatively little is said in the early reports and narrations concerning the inner disposition and characteristics of the Archipelago. If exploring parties crossed the country nothing was said about it, and no attempt was made to investigate the secrets of the country. Yet there must have been considerable travel by foot. When the nine British whalers were left in 1630 they crossed ten leagues of land in order to reach Bell Sound where the London station was. Mention was early made of "sea coals" that burned freely. As lead was noticed on Bear Island in the first years of the seventeenth century, it is probable that some search would have been made for it on Spitsbergen. It is possible that one or another of the early whalers strolling along the beaches while hunting reindeer, or while gathering fuel, may have picked up bits of quartz showing gleams of gold. Dr. R. N. Rudmose Brown declares categorically that "gold-bearing quartz has not been found despite reports to the contrary." Nevertheless a quartz pebble picked up a few years ago on the shore of Coles Bay, when assayed showed that it bore twenty-seven thousandths of an ounce of gold and one hundred and forty-eighths of an ounce of silver, indicating a value of sixty-two cents a ton. From a hill called Alabaster Hook a rock is believed to have been imported for use in

the Delft porcelain works toward the end of the seventeenth century.

To the sailor-men the interior must have been a dangerous and forbidding labyrinth of ice-fields and glaciers, as they occasionally looked down upon the landscape from some mountain top; and if they climbed up they were glad enough to get down, as is proved by various accounts of such experiences. For example, a Dutch captain, *Ouwe* Kees, and a companion named Bommel, in the year 1654 proceeded a considerable distance up one of the Spitsbergen glaciers and then turned to go back. The captain told Bommel that he had discovered an easier way of descending than to walk: it was to let himself slide. He did so, and went so fast that "everything shimmered before his eyes and he became like a blind man."

Bommel's Slide. Bommel followed his example and soon passed him, waving his handkerchief as he went and shouting gleefully, "I'll be down first, captain," or words to that effect. He kept his word. He flew over the edge of the precipice which, according to the narration published in Leyden in 1684, was twice the height of the west tower of the Amsterdam church. The captain succeeded in checking his mad course by means of his heels and made his way to the ship. He inquired of the crew if they had seen anything of Bommel. They said they had not. Although he had made up his mind that the poor fellow had broken his neck, Captain Kees took a boat and rowed along by the foot of the ice in search of him or of his dead body. He was on the point of giving up the quest when a voice was heard faintly crying, "Here I am, here I am!" Bummel after his involuntary bath had swum ashore, and was none the worse for his adventure.

The second edition of the book giving this marvellous incident has a copper-plate engraving, one of the "schoone Kop're Prentverbeelingen" by one-half enlarged from those in the first edition. In this picture an enormous walrus, a Polar bear, and another beast which has the body of a bear and the head of a sheep, and a big fox, are watching with intense delight the descent of the two sailors on the largest of

the seven glaciers, the successive stages being marked by tiny figures and letters of the alphabet. The glacier is represented as being as steep as a house roof, and extends far over the flat at the foot of the cliff, so that Bommel, as he slid down, might easily have plunged into deep water, and thus saved his life. His position in the air just as he went over is marked by the letter E. Whether the men secured the walrus, the bear, and the fox, is not related, and the engraver omitted the most characteristic feature of Spitsbergen scenery; not a bird is to be seen.

Captain Scoresby's Glissade. Captain William Scoresby, who in the early years of the nineteenth century was engaged in whale fishing and frequently visited Spitsbergen, had a somewhat similar glissade which he describes with considerable animation. He had climbed to the top of a mountain on the north side of King's Bay by means of a ridge which he says was "so acute" that "he sat across it with a leg on each side as on horseback." He proceeds in his usual flowery style:—

"The prospect was most extended and grand. A fine sheltered bay was seen on the east of us, an arm of the same on the northeast, and the sea, whose glassy surface was unruffled by a breeze, formed an immense expanse on the west; the icebergs rearing their proud crests almost to the tops of the mountains between which they were lodged, and defying the power of the solar beams, were scattered in various directions about the sea-coast and in the adjoining valleys. Beds of snow and ice filling extensive valleys, one of which, commencing at the foot of the mountain where we stood, extended in a continued line towards the north, as far as the eye could reach; mountains rising above mountains, until by distance they dwindled into insignificancy; the whole contrasted by a cloudless canopy of deepest azure, and enlightened by the rays of a blazing sun, and the effect aided by a feeling of danger, seated as we were on the pinnacle of a rock, almost surrounded by tremendous precipices,—all united to constitute a picture singularly sublime.

"Here we seemed elevated into the very heavens; and though in a hazardous situation, I was sensible only of pleasing emotions, heightened by the persuasion that, from experience in these kind (sic) of adventures, I was superior to the dangers with which I was surrounded. The effect of the elevation, and the brightness of the picture, were such, that the sea, which was at least a league from us, appeared scarcely within reach of a musket-shot; mountains a dozen miles off, seemed scarcely a league from us; and our vessel which we knew was at the distance of a league from the shore, appeared in danger of the rocks."

In order to descend he and his companions took one of the steepest banks, the inclination of which he estimated to be at least fifty degrees, and slid down, accompanied by a great shower of stones of every size. He says:—

"Towards the foot of the hill, an expanse of snow stretched across the line of descent. This being loose and soft, we entered upon it without fear, and our progress at first was by no means rapid; but on reaching the middle of it, we came to a surface of solid ice, perhaps a hundred yards across, over which we launched with astonishing velocity, but happily escaped without injury. The men, whom we left below, viewed this latter movement with astonishment and fear."

It will be remembered how in 1596 some of the *Willem Barents's* crew had an almost precisely similar experience on a great hill of snow on Bear Island. They also slid down *ons naers*. By God's help they got down without breaking their arms and legs on the rocks at the bottom. Barents sat in the boat and watched them slide down, and was in great fear lest they should meet with a mishap.

2. RUSSIAN PROMUISHLENNIKS

The Russians cut no figure in the whale-fisheries; but as trappers, accustomed to procuring furs in Siberia, they may have very early reached the shores of Novaya Zemlya and Spitsbergen. Captain Zorgdrager, who was in Schoonhaven or Recherche Bay in 1697 in company with about two hundred

other ships, all on the point of sailing south under the convoy of nine Dutch and two Hamburg men-of-war to protect them from French privateers, states that several Russian vessels came in and joined them to take advantage of their protection.

First Mention of Russians. Sir Martin Conway considers this to be the first notice of Russian vessels in Spitsbergen waters. He argues from their not being included in the list of the other whalers that they were probably not whalers but trappers. He calls attention to the coincidence that this same year Peter the Great was in Holland, and was shown by the whalers of Zaandam an imitation whale hunt in their harbor. He thinks it possible that the development of Russian enterprise may have been influenced by his interest in that spectacle.

The Four Russian Sailors. If Russia had possessed open harbors, like other countries, it would not have been so slow in developing its merchant and naval fleet. Some whaling must have been carried on from the little towns on the shores of the White Sea: it is known that Yeremeï Ottamkof of Mezen, not far from Arkhangelsk, dealt in whale oil and other such commodities, and that in 1743 he sent up a vessel manned with fourteen men to catch whales and seals. They sailed to the east of Spitsbergen and were caught in the ice. Four of the men landed to seek for a hut on Edge Island, known to them as Maloï Ostrof. While these four men were on land, the ice moved and carried the ship away. They had a musket and twelve rounds of ammunition, an ax, a small kettle, a knife, a tinder-box and tinder, about twenty pounds of flour and a bladder of tobacco. They found the hut a quarter of a mile from the shore and proceeded to put it into fit condition for habitation. For six years they managed to subsist there, ingeniously manufacturing a bow and arrows to serve them after their twelve rounds of ammunition had been spent in killing twelve reindeer. They kept a fire along without ever letting it go out; they used the skins of wild animals for clothes, and when they were rescued by a chance Russian vessel which had been driven out of its course and anchored

opposite their hut, they had collected a ton of reindeer fat, ten white bear skins, and a large number of blue and white fox skins. One of their number was taken sick and died just before the rescuers came. The others reached Arkhangelsk safely. The story of their experiences was taken down and published in several languages and in many editions.

If these men had only known it, they might have made use of the coal, which of the very best quality is found in abundance on Edge Island and is believed to exist also on other islands. Lamont found fossil flowers on Negro Point west of Deevie Bay, and fishermen and hunters have gathered considerable quantities of float-coal along the shores. It is regarded as very dubious whether the coal, however abundant, will ever become commercially available on account of the ice. Perhaps once in twenty years conditions allow of free navigation.

Russian Trappers. The Tsáritsa Elizabeth, daughter of Peter the Great, granted one of her favorites, Count Shuválof, a charter for the northern whale-fishery, and the crew of one of his ships visited the hut where the four men had spent those long years. They found in front of the door a cross with an inscription stating that it had been set up by Alekseï Khimkof, who had been the mate of the ship that left them there. It gave the name of the island as Alekseyevskoï Ostrof. This inscription, and those on the multitudes of crosses erected by the Russians over the graves of the dead, and as testimonials to their faith in God, designating their huts, all along the shores of Spitsbergen, show that not all the trappers were illiterate.

Some of them were sent up by the famous Solovetsky Monastery, the rich establishment of which was situated on the White Sea. Others belonged to the "Old Believers," peaceful and religious men. Later the Russian White Sea Company extended its enterprise to Spitsbergen.

The charter granted by the Emperor Alexander I in 1804 speaks of Spitsbergen as Grumant. We have already noted that the origin of the name is obscure. V. Carlheim-Skyllenskjøld collected everything that he could find about the

winterers between 1740 and 1851. Cr. Rabot published in *La Géographie* in 1901 an article on the Russians in Spitsbergen in the eighteenth century, and Sir Martin Conway gives extracts translated from an article on the Russian Pomuishlenniki on Grumant, published in Erman's *Archiv für wissenschaftlichen Kunde von Rusland* in 1851. A full account of the century and a quarter of Russian occupation would make a good-sized volume in itself.

Superstition Regarding Scurvy. Sir Martin gives in his "No Man's Land" a good many, but not by any means all, of the interesting and dramatic episodes of these adventurous and hardy *Grumalandui.* He cites full descriptions of the characteristic Russian huts, and their distribution according as the game deserted the places where they were at first most plentiful. He relates at full length the strange superstition regarding the scurvy which is believed to go about in human form as an old woman, the eldest daughter of King Herod, and the beautiful maidens, her sisters, who entice young hunters to their death under the weird dancing lights of the Aurora or amid the wild mists and snow storms that descend from the mountains. He relates either in his own words or in citations from widely collated books, thrilling narratives of bravery and disaster.

All such stories, however, are strikingly similar:—they all tell about battles with bears where the men are inadequately armed for such enormous adversaries standing twelve or fourteen feet in height and crunching lances in their terrible teeth; the lack of ammunition obliging the trappers or sailors to shoot reindeer with arrows constructed out of chance nails picked out of floating wreckage. They had to use all their energies to drive away Mistress Scurvy by eating the scant grass, which they found exercised a spell on the old hag, or by drinking the warm blood from the veins of an occasional fox; they cheerfully cut off their frozen hands or feet so as not to die of gangrene; they constructed playing cards out of bits of wood gathered along the ice-bound shores; they spent hours tying and untying knots, so as not to go mad with the darkness

of fifteen hundred consecutive hours of night lighted only by the moon, or by the flickering weird dancing flames of the Aurora; in the cheerless abodes of their huts feebly illumined by tiny lamps wicked with bits of twine, they mended their tattered clothes with the divided sinews of wild animals and made new ones of the skins of bears and reindeer; they saw their fellows perish one by one, and hid their frozen bodies in the snow as best they could to preserve them from prowling bears; they joined in singing the melancholy folk-songs of their native land, and told fanciful stories of the Great Dog that haunted those shores and drove to death hapless mortals that intruded on his domain; and when at last the few survivors were rescued they were ready and eager to go up again under the lure of that mysterious North.

Brave Old Starashchin. The Russian trapper Starashchin, employed by the monks of Solovetskoï, whose serf and faithful servant he was, is said to have spent thirty-nine winters on Spitsbergen, and for fifteen years did not once return to Russia. He died at Green Harbor in 1828 and the cape and mountain at the entrance of that inlet immortalize his name. The ruins of his hut were visible in 1868.

He is described as "a lively ruddy little old man with white hair and patriarchal appearance." Dr. Rudmose-Brown indeed makes him out not a single man but a dynasty, just as some interpreters of the Old Testament consider that the patriarch Methusaleh, instead of living to the age of nine hundred and sixty-nine, was a family name continued from generation to generation.

The Lure of the North. The Norwegian Paul Bjørvik had a number of thrilling adventures, and yet was always ready to accompany any expedition to Spitsbergen. The Tromsø captain Klaus Thue, after being wrecked off Advent Point and having a narrow escape from a terrible death, kept coming back to Spitsbergen; he had a shack at Advent Point, and for a number of summers drove a small trade in selling fossils and skins to tourists, until he was put up as a dummy to claim coal-lands on the shores of Advent Bay.

The Russians had their own names for the islands and other notable landmarks of Spitsbergen. They called Bell Sound, which was for many years a much frequented center for their hunting, Klansbáyeskaya Gubá. Wybe Jans Water they named Títova Gubá. Sir Martin Conway cites Pierre Louis le Roy as saying that Edge Island or East Spitsbergen was known as "Maloy Brown" and West Spitsbergen as "Bolschoy Brown." *Maloï* and *bolshoï* means respectively little and great, but there must be some mistake about the *Brown* or Brun part; it may be a misprint for ostrof, island, or berg, shore: the Norwegian print it as *brovn.*

The larger and smaller Russian settlements or colonies on Spitsbergen and the preponderance of Russian occupation for more than a century was taken as a pretext by the Imperial Russian Government to lay claim to the sovereignty of Spitsbergen, or at least to an equal share in controlling its destinies. It was certainly worth controlling for its game alone, as may be judged if it is true that in the winter of 1818 the trappers killed twelve hundred walruses and many other valuable animals at the South Cape.

3. NORWEGIAN TRAPPERS

The Norwegian hunters were beginning before this time to ravage the islands. They were true to their viking habits. Too frequently they murdered the unsuspecting Russians and plundered their huts.

An Englishman named Crowe, vice-consul at Hammerfest, is said to have founded the systematic exploitation of the Spitsbergen hunting-fields for the benefit of the Norwegians, though they had gone up there for wild animals before that, probably earlier even than the last years of the eighteenth century. In 1819 Crowe despatched a sloop with eleven men who came back with a cargo of walrus, reindeer, and eider-down. The Norwegians tried the experiment of wintering but their huts were not so satisfactory as those constructed by the Russians; as the enterprise developed more and more vessels went up merely for the summer season. The Norwegian

competition finally destroyed the Russian trade. It ended in 1851-52 with a tragedy. A merchant named Kuznetsof sent up a *lódya* or Russian boat with a crew of eighteen men. The captain missed his way, and landed the men at Red Bay where there had been Russian huts for perhaps a hundred years. There the men hunted with considerable success, but during the winter all but six died of scurvy, and the survivors had to abandon their furs but reached Arkhangelsk safely.

Profits From Hunting. The Norwegian succession to the Russian game-fields was not immediately complete: there was what might be called a "closed season" of several years, so that the natural increase was very great. The hunters from Hammerfest, and other towns in northern Norway found immense profit in this enterprise. Some years were far more successful than others, but how profitable it must have been during the nineteenth century may be gathered from practically official reports covering the first ten years of this century. It brought more than two and a quarter million kroner, or nearly six hundred and fourteen thousand dollars, to Tromsø alone.

In 1906 thirty-one sloops brought back to Tromsø two hundred and ninety-six bears, one hundred and thirty-five walrus, some six thousand seals, one hundred and thirty-six white whales, two thousand, eight hundred and eighty-eight reindeer, one narwhal, sixty-one blue foxes, and a half ton of eiderdown. In 1909 there were brought to the same place twenty-nine thousand, seven hundred and eighty-five large seals, one thousand, six hundred and ninety-four small ones, three thousand, eight hundred klapmyds, twenty dead walruses and one living (estimated as worth eight hundred kroner), four hundred and twenty-one dead Polar bears and twenty-one living ones (worth two hundred kroner each), three live blue foxes and two hundred and seventy-three dead ones (worth ninety kroner each), two hundred and fifty-one white foxes (at twenty-eight kroner each), one hundred and eighty-four reindeer, and two thousand, two hundred and fifty-six kilos of

uncleaned eiderdown—a total catch amounting to three hundred and sixty-nine thousand, seven hundred and forty kroner.

The same year the total catch for Hammerfest was estimated at four hundred and twenty-seven thousand, eight hundred and eighty-six kroner; that for Vardø was one hundred and eleven thousand, seven hundred and thirty-eight kroner but that included six hundred and ninety-two hektoliters of *haakjerring* or shark livers.

The preceding year—1908—there were brought to Aalesund more than eight thousand small seals, nearly twelve thousand klapmyds, one live and forty-seven dead walruses, thirty-seven live and one hundred dead bears, the value of the catch being officially estimated as two hundred and seventeen thousand kroner. To this must be added the catch attributed to Trondhjem, Arendal, and Sandefjord, and valued in 1907 at a quarter of a million kroner; but the value of the seals included in this estimate should probably not be attributed to Spitsbergen but to the waters between Greenland and Jan Mayen. More than a hundred vessels, ranging from thirteen to one hundred and ten tons, and carrying an average crew of ten men, were in the Spitsbergen hunting industry.

More and more Norwegians became accustomed to winter on Spitsbergen, and their adventures were attended with many fatalities, through accident, outlawry, or scurvy. In 1893 the Norwegian trapper Braekmo spent the winter at Green Harbor, having for his only shelter an overturned boat. He got plenty of exercise, and by varying his diet found himself the following summer in perfect health. Four Norwegian fishermen with their families, consisting of two women and a three year old child, lived during the winter of 1898-99 near the Tourist Hotel at Advent Point, sheltered only by canvas tents, and suffered no permanent impairment of health. One of the men, Hans Turfjord, kept a log in which he entered brief mention of the weather and of their activities. Their last connection with Norway ceased on September 1, when a *galeas,* which had come up from Tromsø with a cargo of coal for the Prince of Monaco's yacht returned. They brought in for them-

selves about one hundred hektoliters which they gathered between Advent Bay and Coles Bay. Such a storm was raging that they were obliged to drag their boat along the shore, being unable to row it.

In the middle of January, 1809, there was sufficient daylight for them to read by. On the 18th the Celsius thermometer indicated 30° below zero. On March 5 the cold was so intense that they dared not venture more than a hundred meters from their tent. They could no longer take observations from the scale, but estimated that it was at least 55° (corresponding to about one hundred by Fahrenheit). On February 15 the tops of the highest peaks began to catch the first beams of the returning sun which on March 3 touched the Tourist Hotel. There was a comparatively small snowfall throughout the winter.

They were much disappointed at the scarcity of game. Days passed without their seeing a single living thing. But on their expeditions to Sassen Bay and elsewhere, they bagged six reindeer and three calves. They saw one bear about thirty meters from the camp but failed to get him; others were seen feeding on seals but too far away to shoot. One, however, they killed about three hundred meters from the hotel. On June 21 the Crown Prince of Italy arrived on his way to Bell Sound. When he heard that women and a child were at the camp he landed to see if any help was needed. The princess and the captain of his yacht were also interested in the condition of the overwinterers, and brought medicine and fresh food for two of the men who were ill, one of scurvy, the other with an injured hand. Under such ministrations they speedily recovered.

The same year four Norwegians spent the winter at the South Cape. They had two stations, one on the main land, the other one on Ronde Klip Island. Two perished; the other two returned to Norway, bringing with them fifty Polar bear skins. Two other Norwegian hunters spent that winter on Half Moon Island and died there. In spite of their sufferings and tragic end they killed twelve bears in five months. Other

adventurers in later years had varying fortunes; but it is reported that in 1913 the Norwegian huntsmen of Tromsø and Vardø brought back, mainly from Spitsbergen, two hundred and nineteen bear-skins.

When the Polar bear is fat and has not been feeding on dead and stinking seals the flesh is palatable. Its liver is extremely poisonous. Reindeer meat is generally sweet and tender during the period when the animal gets abundant food. The heart, liver, and tongue, when smoked are regarded as delicacies. As late as 1860, before reckless slaughtering had diminished the herds, it was estimated by Baron Nordenskjöld that the Norwegian hunters brought back about three thousand of them every year. The marshy moss-grown valleys where these animals formerly congregated are called Rendaler. In 1913 only two hundred and thirteen were brought back to Norway. Zoölogists regard the Spitsbergen reindeer as a distinct variety of the species. It averages one and seven-tenths meters in length and weighs about a hundred kilograms.

Nottingham Bay between Horn Sound and Bell Sound has three little islands not indicated on the charts. They are low and flat and have a large number of fresh water ponds, affording a favorite nesting-place for the eider ducks. These are visited in June by down-gatherers, and richly reward the seekers. It is said that in 1913 twenty-four hundred and fifty-one kilos of down were brought to Tromsø alone.

Extermination of Game. Of course such unregulated hunting tends to exterminate all living things or to drive them away to regions still more difficult of access. A succession of "closed seasons," such as the United States proclaimed for the protection of the seals on the Pribilof Islands, would, however, restock the land, and then give scope for all legitimate hunting. All accounts agree as to the indiscriminate destruction of wild life, principally by the Norwegians. In a land of lawlessness there has been no way of preventing the use of poisoned bait. No one can begin to realize how many reindeer, bears and foxes, as well as birds, have been destroyed by strichnine to no advantage of the huntsman, for the reason that poisoned

animals, when they feel the mysterious death coming upon them, go away and hide, and their bodies are rarely found. Still another reason for the rapidly diminishing supply of game on Spitsbergen has been the invasion of amateur hunters brought up on the tourist-ships and on private yachts. Having no local interest such visitors are unsparing, with the result that valleys and plateaus which used to abound in reindeer are now wholly vacant of them. This has been the tragedy of man's contact with nearly all the wild life of the earth.

Norwegian overwinterers have also acquired an unsavory reputation for the disgraceful way in which they take possession of the property of others, and for the filthy state in which they are in the habit of leaving such houses as they occupy, whether the shacks of miners or the huts of trappers. In a lawless land they were the cuckoos of outlawry, robbing, defiling, and willing even to murder for the sake of a little paltry or peltry gain. Even the well-built houses put up by various governmental scientific expeditions have been violated by unscrupulous trappers, and left after a winter's occupancy entirely uninhabitable.

IV. THE GEOGRAPHY OF SPITSBERGEN

1. MAPS AND CHARTS

THE CONSTANT search of the early whalers for bays where their prey congregated, and where there was suitable ground for their cookeries, led to familiarity with the outline of the archipelago. The chase of the reindeer brought some knowledge of the interior. But the charts prepared by the ship captains, especially those that were commissioned to make explorations, kept pretty closely to the coast-line. There is a considerable number of such maps and charts. Sir Martin Conway prints in his "No Man's Land" a chronological list of more than fifty dating from the seventeenth century, but he makes no claim that it is complete. He says that the Muscovy Company "from the first caused surveys to be made of the coasts explored by their servants, but they seem to have endeavored to keep these surveys secret." One chart, made by John Daniel from materials belonging to the Muscovy Company, was carried to Holland by an Englishman who fled from London because of his debts. This was published in Amsterdam in 1613. The Great Fire in London may have destroyed all the charts which had been made before the decline of English whaling. The Dutch took up the enterprise of issuing maps of Spitsbergen, and if any English publisher brought out one it was only a belated copy of some Dutch map. Dutch names were applied to capes and islands once named by the English. Many discoveries made by the English were thus falsely attributed to the Dutch.

In 1707 Captain Cornelis Giles, who frequented the Spitsbergen waters from 1700 until 1714, circumnavigated the whole Archipelago. Another Dutch captain, Outger Rep, followed his example. These two men were commissioned by Gerard van Keulen of Amsterdam to make a new map of

Spitsbergen. Sir Martin Conway says this chart "represents the highwater mark of the prescientific surveys of Spitsbergen. Almost every important feature of the coast is set down, somehow, though with great inaccuracies in latitude and longitude. Some features are depicted which the modern charts wrongly ignore. . . . On the whole the chart is a very fine work for its date." It was used for more than a century. It is interesting to know that the library of the New York Geographical Society possesses the original drawing of a free copy of it, made by R. van Wyck toward the end of the eighteenth century. The outline-surveys of Spitsbergen have enabled geographies and encyclopedias to state with a fair degree of accuracy the length, breadth, and area of the islands that constitute the Archipelago. This has been already sufficiently covered in the Foreword.

Strange Contrasts. All these island divisions of Spitsbergen present quite extraordinary contrasts. On the western coast are the chains of mountain which first struck the eyes of their discoverer and occasioned the suggestive name. Their steep slopes and jagged peaks are free of snow, though the valleys between them are filled with imposing glaciers reaching to the cliffs of the coast; these when they *calve* fill the adjacent seas with fragments of ice, forming the icebergs so dangerous to navigation. These mountains are "composed of compressed, upturned, hard schist, sandstone and dolomite" of the Hecla Hook formation. Great quantities of snow are precipitated on them by the prevalent west winds; it finds little lodgment on the sharp peaks but blows off and into the valleys, where it melts rapidly during the short summers. Wild torrents flow down with multitudes of branches, some of them having as many as fifty, carrying with them the silt from the wearing away of the rocks. The valleys, therefore, are extremely difficult to cross. For this reason, though they lie so near the coast, few explorers were successful in penetrating into the mountains and the lands beyond. Not until 1890 was the region between Horn Sound and Bell Sound crossed by any man of science. Gustav Nordenskjöld found it an ex-

tensive ice plain, without crevasses or out-rising peaks, called by the Eskimos *nunataks.*

In the northwest the mountains, consisting of gneiss and Archaean granite, have been worn away, and are low and even. Captain Isachsen found that the country, *back* from the coast was a plateau, cut by many deep parallel valleys "in every respect corresponding to the low group of mountains with which the Scandinavian peninsula closes on the Arctic Ocean—on the North Cape, for example."

The Great Fjords. In the region of the great fjords of South Spitsbergen are found parallel and undisturbed strata of loose sandstone, stretching out for miles. But the lofty wild walls of rock through which the fjords cut are ancient dark stone. The valleys are filled with the moss which, when the reindeer were still abundant, furnished them with their favorite feed. It used to be remarked how tame they were. If a man shot at them and missed they would "draw near and see what was the matter." Alas! they are now practically exterminated.

This extensive region is comparatively free from snow; glaciers are found only high up in the recesses of the valleys between the gently rising hills; many of these glaciers seem to be retreating. Geologists have offered various explanations for this ice-free tract. The most obvious is that the mountains which shut it off from the west collect the condensation of moisture on the ocean-side. But Otto Nordenskjöld thinks that the real explanation is to be found in the "comparatively loose later formation lying horizontally . . . and forming a fairly warm soil surface which would readily concentrate the heat of the sun."

Continental Ice. New Friesland is composed of hard folded strata of Archaean rock, and of the Hecla Hook formation. It is one of the wildest territories of Spitsbergen, containing the highest mountains in the archipelago, Mount Newton, measuring seventeen hundred and thirty meters—about five thousand, six hundred and seventy-six feet. They were first seen by Karl Chydenius who accompanied Torell in

his expedition of 1861. His name was given to them, but it was so long before anyone else saw them that they came to be regarded as mythical. New Friesland, however, was chosen by the Russo-Swedish engineers in their work of measuring a degree of latitude, and it was then learned that they were all covered with ice, which descends to the sea in glaciers as magnificent as those on the coast of Greenland. This covering of ice is marked by many nunataks and outshoots of feldspar, and it is not generally regarded as a true "continental ice sheet."

To find such a sheet one must go to North-East Land (Smyths Land), the whole of which is covered without a break. Its average height is about six hundred meters—two thousand feet—and the shelterless level is interrupted by crevasses and wide "canals" occurring every hunderd meters or so, making progress over it slow, difficult and dangerous. It was first crossed in 1873 by Adolf Nordenskjöld and Palander. Strangely enough on the King Charles Islands still farther to the east ice is lacking; the horizontal strata of rocks are composed of diabase and fossiliferous strata of the Jura formation.

Still farther to the east is an island supposed to have been discovered and called Giles Land in 1707; it was then relegated to the domain of myth. Dr. A. G. Nathorst visited it, and found it covered with a mass of ice out of which rose a few mountain peaks composed of Archaean rock. About a hundred kilometers still farther to the east lies Franz Josef Land, which is called "the most characteristic Polar country of the Arctic region." There are only isolated cliffs free from snow, and yet the rock is of late geological formation. It is exposed to the extremest cold of the North, and supports only fourteen of the hardiest plants of the Polar regions, scarcely ten per cent of the considerable variety found elsewhere in Spitsbergen.

Bear Island. Otto Nordenskjöld found on Bear Island geological conditions strikingly like those characteristic of parts of the Spitsbergen group. He gives an interesting de-

scription of one of its most striking geological phenomena. He says:—

"The southern part of the island is a mountainous country rising four or five hundred meters above the level of the sea; the northern part is lower,—an almost level plateau with numberless small lake-basins. That plateau as well as the mountainous region descends to the sea in almost perpendicular cliffs which have been greatly cut and abraded by the waves. They stand out sharply against the smooth, rounded forms that are seen in the higher parts of the island. The first to call attention to this contrast was J. Gunnar Andersson, who based his explanation of the smooth outlines on the following observations:

Mud Glaciers. "Very frequently a banded arrangement of the talus is seen on the slope of the hills. Looking more closely one sees that these bands consist of accumulations of rough stones and clayish mud extending from the top of the hill to the valley where they often broaden out like a glacier, pushing before them a perfect 'terminal' moraine, composed of splinters of rock. It is quite evident that this mass has been or is slowly moving downward. Above, on the upper borders of the 'mud glacier,' are traces of huge snowdrifts, which as they melt soak into the talus lying below them. This talus, thoroughly permeated with water, becomes a sort of pap and begins to slide slowly down the slope. Usually this liquid earth is free from all vegetation; the few plants found in it show by their enormously developed roots how they have sought to accommodate themselves to unfavorable conditions.

"This great accumulation of disintegrated material formed by weathering, carried from the upper to the lower part of the country, does not flow like running water in narrow streams, but glides downward in broad, contracted bands, which, according to Andersson, impart to the landscape its peculiarly rounded outline.

"Generally speaking this 'flow of detritus' or 'solid fluxion' may be found in other places, where the prerequisites for the saturation of the earth with water are present; yet an earth

saturation like this can be expected only in a climate where the ice does not remain permanently, and where there are snow and a very meager vegetation. Similar conditions are found outside the Polar regions in certain mountain districts; but if traces of a similar activity are ever seen, it may be concluded as a rule that the climate and natural conditions were once like those of Bear Island."

Landslides. Precisely similar landslides are found in parts of Spitsbergen, where slopes look as if they were striped, and are found on examination to consist of narrow bands of fine or coarse talus, or clay, alternating in rapid succession, the whole mass being "very well sorted, so that every band, as a rule, consists of approximately the same-sized pieces of gravel or rock."

Ice Fjord. Singularly like Norway, West Spitsbergen is penetrated by extensive fjords which are regarded as submerged rivers. The largest of these is known as Ice Fjord or Ice Sound. It figures on the early charts as Grooten Inwyck or the Great Indraught. It is about one hundred kilometers long, and in some places twenty kilometers wide. At the entrance it is two hundred and fifteen fathoms deep; farther in it varies from one hundred to sixty. It has a number of tributaries or branches, the most important of which are Green Harbor, Coles Bay (once, from the abundance of reindeer in the vicinity, known as Coles Park, and sometimes, because of the outcrop of coal there, misspelled as Coal Bay); Advent Bay, shortened from Adventure Bay (so called from Whitwell's ship *Adventure*), but properly marked on the chart as Klaas Billen Bay; Sassen Bay, once Sassele Bay; North Fjord, and Dickson Bay, early known as Behouden Bay or Safe Harbor.

Bell Sound, or Klok Sund, opens widely also into the land south of Ice Fjord, and has also several branches:— Schoonhaven, called, since the visit of the French expedition of 1838, *Recherche Bay;* Sardam, or Saandam Bay, or Van Keulen's Bay; and (shut off by a long low narrow island known as the Rock in Bell Sound, or by its Swedish designation Axel Island), Low Sound, sometimes erroneously called

Muyen or Muyden Haven, which opens successively into Michiel Binder's Bay and Braganza Bay.

Foreland Sound. Prince Charles Foreland is separated from the main island by the Foreland Sound, called Keerwyck by Barents, who found the northern entrance to it nearly shut off by a bar. Poole gave it the name of Foul Sound, and Scoresby, mistaking the kind of foul, called it the Bay of Birds. The part north of the bar has for its guardian pillars the famous Vogel Hook on the Foreland side, and Quade Hook on the east, separating it from King's Bay, called by Hudson, Whales Bay, by Poole, Deere Sound, and opening out into Close Sound, or Close Bay, with a small harbor called Cross Road.

The Northwest Bays. The northwest corner of Spitsbergen is a network of bays and passages between small islands nearly all famous in history. Here close together are Magdalena Bay, Mauritius Bay (misnamed Smeerenburg Sound) three miles wide and from ten to forty-five fathoms deep, with Fairhaven between them, and Danes Island and Amsterdam Island in close proximity. Beyond and to the northeast, after passing Vogel Hook and Cloven Cliff, one comes to Red-cliff Sound, Broad Bay, Wiche Sound or Liefde Bay, and Wijde Bay, earlier named Sir Thomas Smith Inlet, which vies in length if not in depth, with the Ice Fjord, two main branches of which reach out as if to meet the corresponding branches of it. They are separated by high ridges opening both north and south into glacier-filled valleys.

Between New Friesland (appropriately named!) and Northeast Land is the now thoroughly surveyed Hinlopen Strait leading into Olga Strait, which communicates by Unicorn Bay and Heley Sound, and by Freeman Strait, with the wide Wybe Jansz Water.

Horn Sound. The most southerly fjord is known as Horn Sound, so named by Poole who found the antlers of a reindeer on the shore. It has several branches and is dominated by the high peak Hornsund Tind, or Hedgehog Mountain, which Conway climbed and found to be four thousand, six hundred

and ninety feet high. Conway devoted a careful examination to all the bays, capes, islands, and other natural features of the archipelago, and, as may be seen in an appendix to his "No Man's Land," has tried to restore the proper designations, which as one can easily perceive, have been sadly confused by the zeal of successive "discoverers" belonging to different nationalities to rename them.

Characteristic Mountains. The most conspicuous feature of Spitsbergen, as the very name signifies, is its serrated system of mountains. One of the first, if not the very first to acquire a name, is in the south of the main island and was designated by Jonas Poole as Muscovy Company's Mount; the next was Bell Point, so called "because of a hill formed like a bell on the top." This also gave the name to Bell Sound or Klok Sund.

Many of the names are fortuitous: Bunting Bluff, which is two thousand, four hundred and eighty feet high, was called after a snow bunting seen there; Fox Peak, three thousand, one hundred and eighty feet high, immortalizes the fresh tracks of a fox, a less literary name than Mount Malapertus on Bear Island. Temple Mountain, which rises about three thousand feet straight out of the water, was so called because the architectural hand of Nature gave it imposing bands and buttresses. Diadem Mountain reaches a height of four thousand, two hundred and fourteen feet; it was climbed first by Conway, and later, twice, by Captain Gunnar Isachsen. Other mountains more or less properly lift aloft the names of scientists or voyageurs. Such, for instance, is Mt. Nordenskjöld, which is frequently mentioned in the works of recent visitors. It is eleven hundred and fifty-five meters high. Still higher is Mount Poincaré—five thousand, four hundred and forty-six feet.

The Discovery of a Volcano. On the high peaks, east of Wood Bay, layers of lava and débris of evident volcanic action were discovered in 1910 by the Norwegian geologist Holtedahl. In a branch of Wood Bay he found an extinct crater built up by lapilli or fragments of rock; the cone much

resembling those of Vesuvius or Aetna. It is supposed to have been thrown up in the Quaternary period, and later than the formation of the fjord on which it is situated. It rises to a height of sixteen hundred and fifty feet. In the vicinity are eight hot springs discovered by Captain Gunnar Isaachsen in 1909, with a temperature of 75° to 82° Fahrenheit. They deposit countless steps or basins of tufa-like material with stalagmites. There is a considerable flow of water bubbling with gas. Dr. Martens records his observation of "a great and high mountain on Amsterdam Island." He wrote that it was "usually covered with cloud, when the wind blows over it and darkens the haven as if smoke were coming from it." Another earlier visitor speaks of mountains which seemed to be all aflame.

Jan Mayen Land. Lying five hundred miles to the west is the solitary Jan Mayen Land, known to the early Icelanders, but rediscovered in 1611 or thereabouts and named Mauritius or St. Maurice, in honor of Prince Maurice of Nassau. It belongs to the same geological formation as Spitsbergen and Bear Island. Its distinguishing landmark is a mountain six thousand, eight hundred and seventy feet high, visible in fair weather for a hundred miles, and also named Bear Mountain or Beerenberg. This peak is of volcanic origin; here are many traces of lava, great blocks of calcined clay, large masses of red clay and friable trap-rock, and vesicular basalt with beautiful crystals and grains of augite, and stone resembling "the celebrated basaltic millstone of Andernach." At a height of fifteen hundred feet is a beautiful circular crater five or six hundred feet deep, and six or seven hundred yards in diameter, with a subterranean cavern penetrating the side near the bottom, with a spring flowing from it.

Volcanic Action. On the southeast side is a stupendous accumulation of lava, castellated in form, and marking the former activity of another crater. From the abundance of iron and the strongly magnetic iron sand on the beach, it seemed to Scoresby the iron furnace of Nature. He thinks it was in eruption as late as 1818. From his ship *Fame* could

be seen considerable jets of smoke discharged from the earth at intervals of three or four minutes, and rising to a height of four thousand feet. Captain Gilyott of Hull witnessed the same phenomenon in April, 1818. He called his officers and pointed out to them "a shining redness resembling an immense fire," and humorously intimated that the Moon had landed on Jan Mayen.

Seven Dutch sailors who attempted to winter there in 1633 heard on September 8 "a noise as something falling very heavy upon the ground but saw nothing."

The volcanic activity on the marine plateau, which rises to the surface only in the Spitsbergen system of islands, can not be in any way compared with that which awakens the wonder and awe of visitors to Alaska and the Aleutian Islands, where Bogoslof rises and sinks and rises again in the course of a year, and where Mount Kenai covers the adjoining territory with ashes within a radius of a hundred miles. Vulcan has transferred his mighty forge half around the world, and left only expiring fires, or heaps of lava-slag.

2. SCIENTIFIC DISCOVERIES

The early explorers, though occupied mainly in finding new channels for trade, made some scientific observations; at least they corrected many of the crude and ridiculous notions which ignorance always seemed to cherish about unknown regions. Barents found that the rotgansen, or barnacle geese, had their nesting places on islands north of Spitsbergen, and showed the falsity of the amusing theory then current that their eggs grew in Scotland on trees overhanging the water. The one-legged Dutch *stierman,* Joris Carolus, the map-maker of Enkhuysen, went up to Spitsbergen in 1614, and was perhaps the first to conclude from the constant current flowing along the coast from the north that the land was not connected with Greenland.

The First Scientific Expedition. The first genuinely scientific expedition was sent up in 1653 by Frederick III, King of Denmark; it consisted of three ships commissioned

to explore the Polar Ocean and report on the products and characteristics of the lands: it would be interesting if we could know what report, if any, was ever made. In 1671 Friedrich Martens of Hamburg went to Spitsbergen as a surgeon on a whaling ship. He was "moved to make the uncomfortable journey" by a scientific impulse. He brought back with him the first botanical collection; he made observations on the birds, and replied as far as he could to questions which had been put by the Royal Geographical Society. He published an account of his experiences and has the credit of laying the foundations of Arctic science.

Captain William Scoresby. Captain William Scoresby, the son of a successful whaler, made many voyages to the vicinity of Spitsbergen, and published, in 1820, in two large volumes, an account of his observations which were generally accurate and informing. He landed many times on Spitsbergen and gives animated and vivid descriptions of the wild nature which he found there. Three years after his work was published Sir Edward Sabine was sent to make pendulum-observations on the coast of northern Spitsbergen. He set up his observatory on the Inner Norway Island, and, after making many studies and accurate measurements, he became convinced that Spitsbergen was an ideal place for laying out an arc of the meridian. He failed to communicate his enthusiasm to the British authorities and the great and important work was taken up two or three decades later by the united Swedish and Russian Governments, under whose auspices, after several seasons were spent in the survey, it was finally finished as the present century was beginning.

An English Surveyor. In 1827, Lieutenant Foster, of the Parry North Pole Expedition, was detailed to carry on scientific observations, also in the north of Spitsbergen. He made surveys of Treurenberg Bay near the entrance of Hinlopen Strait and did some geological work. He noted the great number of graves along those bleak shores, and made out the date of one of them to be 1690. He examined the great glaciers at Hecla Cove under the brows of Hecla Hook.

He was ordered to observe the dip and variation of the magnetic needle, to record the changes in temperature and air-pressure, to ascertain the depth and temperature of the sea, and to collect all such specimens of natural history—animals, plants and minerals—as might be deemed "new or curious." His party killed seventy reindeer and three bears.

Keilhau the Pioneer. The same year Professor Balthasar Mathias Keilhau, of Kristiania University, the first Norwegian of scientific education to become interested in Spitsbergen, went up in a dirty little craft at his own expense. He was accompanied by the German Burgomaster of Burtscheid, Barto von Löwennigh. Both of them published books about their experiences. Keilhau was the pioneer in geological investigations in the archipelago.

Two Englishmen who happened to be at Tromsø were offered the opportunity of accompanying Keilhau, but when they saw the ill-conditioned craft that was to make the trip, their scientific enthusiasm evaporated. A good many British sportsmen of the titled and wealthy class went up to Spitsbergen for game, but for the most part their work was destructive rather than constructive. Dr. Rudmose Brown, who devotes a chapter in his book to the exploration work, and to the scientific contributions of Englishmen and men of other nationalities, to a knowledge of Spitsbergen, takes a somewhat malicious and unholy joy in citing from the Marquess of Dufferin's imaginary picture of winter life there. In 1921 Captain Isachsen published a brochure of fifty pages, largely devoted to exploiting the discoveries made by Norwegian skippers and the scientific observations of Norwegian scientific men. It contains many interesting details of suffering and heroism.

The Voyage of Lamont and Leigh Smith. More important than the majority of English voyages of the nineteenth century were those made by James Lamont and Benjamin Leigh Smith. Between 1858 and 1871 Lamont spent several summers in Spitsbergen waters, and published in London first his "Sporting in Spitsbergen" and then, fifteen years later, in 1876, his "Yachting in the Arctic Seas; or Notes of Five

Voyages of Sport and Discovery in the Neighborhood of Spitsbergen and Novaya Zemlya." It is a notable incident that he got coal for his yacht the *Genevra* in 1859 at King's Bay, and that he reported the presence at Advent Bay of a rich bed of Tertiary coal. His volumes are full of valuable information regarding the wild life in the far north, as well as of charming descriptions of scenery and adventure. Smith made still more important explorations in the northeastern limits of Spitsbergen in the summer of 1871; but when he returned the next two summers in a large steam yacht, for which he discarded his little schooner *Sampson,* ice-conditions prevented him from achieving any further notable success. He himself seems not to have been a writer, but there was newspaper notice of his memorable services in scientific exploration, and his name has been attached to the eastern cape of Northeast Land.

England has no great reason for pride in the achievements of its scientific men or of its explorers in Spitsbergen until Sir Martin Conway restored something of national prestige by his adventurous crossings of the island of West Spitsbergen, and by his topographical work in 1896 and 1897, and especially by his historical and descriptive writings.

German Scientific Work in Spitsbergen. Naturally, since the World War there has been a tendency to belittle the explorations and scientific accomplishments of the Germans wherever they have been mentioned. This is notably the case with Dr. Rudmose Brown. But it is best to be fair, and one can hardly pass over in silence the fact that the first German Expedition to Spitsbergen, which was conducted by K. Koldewey in 1868, circumnavigated the east coast and explored its bays, or that Count Wiltschek (or Wilczek) in the *Icebjörd* surveyed Horn Sound in 1872. His exploits were enthusiastically reviewed by Admiral Max Freiherr Daubleosky von Sterneck and Ehrenstein for the Hydrographic Bureau of the Austrian Marine. In 1898 the Berlin Natural History Museum commissioned Drs. F. Römer and F. Schandrin to proceed to Spitsbergen and make zoölogical collections. What-

ever may be thought of the political significance or the scientific importance of the Count Zeppelin Expedition of 1910, the account of its voyage, illustrated with its fine colored photographs and its half-tones, contributed by various members of the scientific corps accompanying its leaders is filled with the good old-fashioned spirit of *Gemütlichkeit* which we have more than half learned to forget.

Cruise of La Recherche. Comparatively little attention has been paid to Arctic affairs by the French, but one must not fail to mention the voyage of the cruiser, *La Recherche,* which during the reign of Louis Philippe was sent to survey the northern coasts of Norway and Sweden. In the summer of 1837, it visited Spitsbergen; the officers set up an observatory on a height of five hundred and sixty-four meters overlooking Schoonhaven, and made some studies of the meteorology, geology, and botany, of the neighborhood; they also charted the bay, which in honor of their visit was renamed Recherche Bay—another example of the confusion of nomenclature in Spitsbergen. The following year the same ship went up to Northwest Spitsbergen and made some soundings and surveys in that historic region. The account of these two expeditions was published with many fine illustrations.

Swedish Scientists. The Swedish scientific conquest of Spitsbergen began with the merely personal expedition of Professor Sven Lövén of Stockholm in 1837. He went up on the small vessel *Enigheten* at his own expense, and made soundings and dredging experiments along the west coast, and also studied the geology.

Lövén kept up his interest in Spitsbergen, and twenty years later communicated his enthusiasm to Otto Torell, who, in 1858, in the yacht *Frithjof* visited most of the fjords on the west coast, with Baron A. E. Nordenskjöld and A. Quennerstedt. In 1861 the Swedish Government granted twenty thousand kroner for a new expedition, and when this sum proved inadequate, paid the resulting deficit of seventeen thousand. Betwween 1837 and 1908 the Swedes sent up twenty-four expeditions, at a cost of more than twelve hundred thousand

kroner, the State contributing more than half a million besides furnishing vessels.

Base of Sweden's Claim to Spitsbergen. Sweden's claim to paramount interest in Spitsbergen was based on the scientific research carried on with few interruptions annually for more than a half century by the savants of that country. Otto Nordenskjöld claimed that Sweden had "sacrificed more than all other countries for the genuine development of Spitsbergen."

A Swedish bibliography, compiled some years before the war by J. M. Huth, gives the titles of eighty-six Swedish voyages and expeditions, forty-seven on the geography of Spitsbergen, thirty-six on physics and meteorology, sixty-three on geology and paleontology, fifty-two on botany, eighty on geology, besides at least sixty maps constructed by Swedes. Many of these works are purely technical, and offer no especial appeal to the ordinary reader; but occasionally one comes across a bit of natural description, or an anecdote of personal adventure, that repays glancing through them.

V. FIRST COAL DISCOVERIES

1. THE OBJECTS

IT MUST not be supposed that pure zeal for knowledge was the only motive that animated the Scandinavians. There was always the hope or expectation that valuable minerals or other deposits might be found. Thus in 1870 Hj. Wilander and A. G. Nathorst went up in the sloop *Lydiana* to investigate certain strata supposed to be rich in phosphates at Cape Thordsen in the Ice Fjord, and as a result of their reports a Swedish Company was formed to develop them. Considerable capital was expended but they were ultimately abandoned as unprofitable.

Discoveries of Coal. In 1861 C. W. Blomstrand, a member of the Swedish scientific expedition of that year, contributed to the Transactions of the Royal Academy of Sciences, Stockholm, an account of a discovery made by him of extensive strata of coal, which he discovered during a ten days' investigation of the region around King's Bay at the northern end of Foreland Sound. Scoresby had noted that there was marble of real beauty there, and Keilhau mentioned seeing coal at Cross Bay. Blomstrand comments on the previous knowledge of coal there as proved by the such local names as Coal Bay, Coal Mountain (German Kohlenbucht, Kohlenberg; Swedish Kolbugt, Kolfjell). But he was unable to obtain from any of the old fishermen,* accustomed though they were to visit the fjords and harbors every year, the slightest indication that they knew of its recurrence. He was incited to an

*The "Aarbok" of the Norwegian Geographical Society for 1916-1919; published in Kristiania in 1921 is largely devoted to Spitsbergen and Captain Gunnar Isaachsen in two articles aggregating two hundred and fifty pages gives biographical sketches of all the principal skippers and *Islodser* who voyaged to the archipelago. It is illustrated with portraits and pictures of their vessels, not omitting the Russian *lodyas* converted into hunting-ships. The last article ends with a passionate defense of Norwegian jurisdiction.

investigation by the discovery of scattered bits of coal on the seashore and in the brooks flowing down from the glacier. The glacier was unusually high and difficult to climb, and the main mass of the mountain was a dark slate resting on limestone, pieces of which formed the tremendous moraine. There seemed to be no seam of coal; but just as he had about given up hope of discovering the source of the scattered fragments he found in a small portion of the mountain, laid bare by a stream flowing from a great glacier bordering the other side of it, the outcropping of the coal.

The Coal Strata. He followed along for a distance of about seven thousand feet, and discovered it in four other places, showing that the strata, which were associated with dark-brown sandstone coated with fine scales of mica and bearing many plant-impressions, and with a reddish golden-colored coarser sandstone, above which lies a hard black clay-slate, seemed to have considerable extent; but Blomstrand could not determine it very accurately as he had not the requisite tools for investigation, and, except where it was laid bare by the brook, it was covered with deep accumulations of talus or débris fallen from the mountain.

Vegetable Fossils. Above the moraine mass was a layer of beautiful bright blue-green slate alternating with a rather hard, blackish-gray stone which looked like red gold in the light, and with gray marl-slate bearing fossils, mostly fragments of fish. Then on top of that came a peculiar green stone, perhaps a kind of sandstone irregularly splintered, and without any signs of stratification. A microscope was required to make out exactly what this stone was. The fossilized leaves belonged to deciduous trees, but the fish-fragments were too small for identification.

In still another place between the two glaciers he brought to light an almost uninterrupted stretch of the coal-seam, about eight feet wide, lying in the bottom of a dried-up glacier stream. He hammered off a cubic foot; but again the lack of suitable tools prevented him from determining the extent and richness of the deposit.

Richness of the Coal. The finest coal that he found, appearing in three places under the layer of talus, was of shiny black with conchoidal fractures, and betraying a decidedly woody texture. Where they had been exposed long to the air the strata had a light brown rust. He found that it burned easily with a bright yellow flame, leaving almost pure ash. To his surprise he was unable to detect the slightest indication that this coal had ever been disturbed by the hand of man, and he came to the conclusion that the coal which the Hollanders had once consumed on their ships must have been collected on the seashore and in the wide stone-covered stream beds. Scoresby's remark that the King's Bay coal had been easy to procure gives color to this supposition.

"It is unfortunate," says Blomstrand, "that this coal is in Spitsbergen. Even if it were far richer and more accessible than it is, one condition militates against its value. To transport it from Spitsbergen to Norway, which, since it is the country lying nearest, could alone be considered, would scarcely pay, for the returns would be eaten up by the cost of working and carrying it."

He judged that there was only one way of utilizing it: to dispose of it to the walrus and seal fishers who came to that coast in large numbers. As steam was becoming the motive power of the whale fishermen these deposits might be of great value for such ships, and he thought it could be mined with comparatively little trouble and cost by stripping away the talus which covers the seam, stoping the coal as long as it was easy, and then going to another place for a distance of a mile or two. Transportation to the vessel was simple, the distance from the seam to the sea being only a matter of ten minutes or so across a sloping, almost level, low land, on which a simple railway might be built, the cars descending by gravity. The harbor facing this district was regarded as one of the safest in Spitsbergen with nearly three fathoms of water close to the shore and sheltered from every wind by a horseshoe-shaped island.

Otto Nordenskjöld, writing forty years later, was far more

optimistic regarding the practical utility of the Spitsbergen coal. He attributed its origin certainly to the Tertiary Age, but possibly also to periods as late as the Miocene Age, when there prevailed a climate so warm that a luxuriant plant and tree life flourished, as is proved by the abundant fossil-remains discoverable in many parts, especially in the southwestern regions of the main island. He says: "Only a few years ago the idea of opening up coal mines in Spitsbergen seemed a fantastic dream, but there has been a rapid development and now all conditions are changed. In 1905 an English-Norwegian company sent up an expedition with some twenty miners. To all appearances the experiment was successful. The next year an American company followed their example and now it seems probable that there will be a general race, so to speak, for the coal-fields. Extended districts are now preëmpted or staked for the coal-industry.

"It is hard to predict what will be the outcome of these undertakings. In the first place no one knows as yet the value of this coal and furthermore the harbor and transportation conditions always present difficulties. But on the whole the prospect is, to all appearances, very promising and without question coal-mining on a large scale will sooner or later be carried on as other auxiliaries are."

Stores of Valuable Minerals. Within the compass of a few pages no adequate notion can be given of the variety of geological manifestations discoverable in the adjacent contrasting divisions of Spitsbergen. Some of them have considerable possibilities of profitable exploitation. It has been roughly estimated that the total amount of coal in the three strata, Permo-Carboniferous, Jurassic, and Tertiary, will not fall short of ten billion tons—enough to last Sweden and Norway a thousand years at the present rate of consumption. It was at one time reported that great beds of magnetic iron ore, analyzing as high as sixty-six per cent, exist in Schoonhaven and on Prince Charles Foreland, but later reports deny this excessive value. Hornblende is frequently noted by geologists, and strata of its relative, asbestos, and also copper py-

rites and graphite are reported to have been found. Enormous beds of alabaster, of the purest gypsum, covering at least a hundred square miles with layers aggregating in places two hundred feet thick, the layers separated by alternations of limestone, ought to supply the markets of Europe for years to come. Beautifully veined, and also white marble, different kinds of breccia, green serpentine as well as granite and sandstone, have been uncovered, and the quarries are expected to furnish building materials for the cities of Europe.

2. MOUNTAIN ARCHITECTURE

Nature's Laboratory for Scientists. To Otto Nordenskjöld, just as to other scientists of many nationalities, the chief interest and lure of Spitsbergen, making them forget all the discomforts, hardships, and perils of the Far North, lay in its advantages as "a starting point and station for the scientific investigation of the Polar world." Its easy accessibility and its position make it of all lands in the northern hemisphere the most suitable for such researches. He wished that it should be come a great, free, open-air Museum of Arctic Nature.

Shortly before the World War broke out a German society, formed with the object of preserving natural and historical landmarks, published in its transactions a plea that a considerable portion of Spitsbergen should be set aside as a great international park and a refuge for the wild life of the Polar regions. Naturally nothing came of this suggestion, but had conditions been other than they were it would undoubtedly have appealed to the scientists of the world, since nowhere else in such contrasted proximity exists so extraordinary an epitome of the formation of the earth through its successive ages, and also a living object-lesson of what the Ice-age must have been.

Mountain Architecture. Take, for instance, the peninsula which stretches down into the North Fjord, dividing it into two considerable arms. This formation presents a most beautiful profile of the architecture of mountain-building. It

is admirably described by Dr. Richard von Drasche in a pamphlet published in 1874 under the title "Petrogeographisch-geologische Beobachtungen an der Westküste Spitzbergens."

The southern part of this peninsula is a plain with minor elevations composed of gypsum, gypsum being one of the most abundant and valuable products of Spitsbergen. A mile or two from the southern spur a perpendicular wall of rock rises abruptly and bends in a wide semicircle to the north. A broad cataract falls tumultuously over the steep precipice, and is believed to have been the agent that produced this peculiar rock formation, which is thus described by Von Drasche:

The Arena Cañon. "On the profile of this narrow cañon, which I have called 'Arena,' the strata can be studied in their order. At the very bottom is a vast layer of white granular alabaster about a hundred feet thick, mottled with knots and narrow bands of gypsum-marl. Above that is a mighty stratum of red, fine-grained sandstone, abounding in petrifactions, especially of corals, productidae, spirifers and the like; then a layer of gray well-stratified marls with lumps of flint but unusually lacking in petrifactions. Above that comes a narrower stratum of red sandstone rich in petrifactions, and last of all a black and very thin layer of marl entirely without fossils and carved by disintegration into remarkable columnar forms, constituting the top of the mountain. Toward the north there is a deposit of diabase on this marl.

"If you descend from the Arena to the plain on the west you cross a smaller valley similar to the Arena and, if you continue along the level ground toward the north, you behold a rock-wall stretching away for many miles, with all these strata magnificently displayed. The sandstone strata have been significantly differentiated by disintegration from the marl-slates; and this circumstance has brought about the architecture of the mountain traceable for many miles. The sandstone strata themselves have been worn away by streams of water into remarkably regular crevasses and carved into giant columns.

A Temple of Alabaster. "The enormous bed of white alabaster below, on top the two rows of colossal columns, the dark-colored marl between and all this in the greatest regularity along a rock-wall extending for more than two miles make altogether the impression of a gigantic edifice with colonnades, on a substructure of marble.

"All the strata trend gently toward the south-southwest. When you follow to the end of this rock-wall, which I call the Gallery, the red and green striped sandstones of the Hecla Hook formation finally emerge from the depths.

"The same beautifully-articulated carboniferous limestone strata as go to make up the promontory reappear on the eastern shore of the eastern North Fjord and likewise on the western shore of the western North Fjord in equal regularity.

"On the western shore of the promontory extends a rocky ridge about sixty feet high, separated from the carboniferous limestone by a boggy depression.

A Hill of Diabase. "This consists of diabase in magnificent detached columns. If the alabaster stratum is conceived to be extended, it would come straight to our diabase hill and so there is no question here of a stratiform emergence of the diabase. The hill is highly polished and shows distinct glacier-lines."

Von Drasche found similar mountain-profiles in Skas Bay, on the Gyps Hook in the Ice Fjord, and on the Axel Island in Bell Sound. He thinks it is possible that the interior of Spitsbergen consists of massive igneous rock, and of crystalline schists, projecting in isolated ridges and peaks from the all-embracing ice.

The oldest sedimentary constituent of the Island is known under the name of the Hecla Hook formation, and is supposed to be contemporaneous with the slates of the Swedish mountains. It covers the Archaean rock, and although its age has not been definitely determined, since it is mainly devoid of fossils, yet by reason of a few fish-impressions found in its strata, it is conjectured that it may belong to the Devonian age. The Hecla Hook formation has been divided into three

elements: the oldest consists of gray limestone with veins of white limestone and quartz; then comes compact quartzite, tinted white, gray, and reddish, made up of quartz-grains occasionally mixt with mica; then, latest in formation, appear marly shales, dark gray or reddish-brown, often beautifully banded. Associated with the same masses, and latest of them all, are beds of red sandstone, red pudding-stone, and reddish-brown, clayey limestone. These have been called the "Red Beach" beds from the place where they most notably make their appearance.

The finest example of the profile of the Hecla Hook formation is found in a valley on the west shore of Prince Charles Foreland, the narrow island which stretches for nearly ninety kilometers along the western coast of Spitsbergen, from which it is separated by a narrow sound. Landing upon it is extremely hazardous because of the jagged reefs and spurs extending out hundreds of meters, and continually pounded by the rough surf, which has gnawed into it "a veritable labyrinth of bays and small fjords."

Prince Charles Foreland. At first the island is flat and raised only a few feet above the level of the sea, this plain consisting of almost perpendicular beds of tightly-folded mica schists alternating with beds of quartz and crystalline limestone. Farther to the eastward the limestone becomes a gray limestone in thin beds with veins of white limestone and pyrites, forming the first stage of the Hecla Hook formation. Some of the mountains rise to a height of more than 4,000 feet. A few kilometers from the northwestern end of the Foreland the valley is protected by two colossal rock-pyramids. At the foot of each area is light yellow-gray sandstone, greatly contorted and mixt with layers and knobs of mica schist. This is topped with angular fragments of red and white quartz cemented together by a green chlorite slate-like substance, forming a typical breccia, blocks of which are scattered in wild confusion all over the valley. This hard substance has served to preserve the shape of the pyramids, which rest on fairly horizontal beds of either white or black limestone.

Hecla Hook Formation. Higher strata of the Hecla Hook formation have been observed at Klaas Billen Bay in the Ice Fjord. As you sail along the west shore you distinguish beds of subcarnoniferous limestone mixed with strata of yellow, violet, and red limestone, and marl with bands of white mica sheets. This is succeeded by red sandstone, deeply colored by limonite, and containing large rounded boulders of quartz and schist, together forming the Red Beach beds which are regarded as intermediate between the first and last stages of the Hecla Hook formation. The end of the fjord is enclosed by mountains of ferruginous sandstone covered at their peaks with limestone.

The Triassic rock formation is seen widely extended at Ice Fjord where there is a mountain with nearly perpendicular cliffs more than sixteen hundred metres in height, and crowned by a broad plateau. Dr. Von Drasche named this Mt. Tschermak, after his teacher in Vienna.

A Mountain Profile. The profile shows first black bituminous marly shales rich in fossils of coprolites, cephalopods, and bivalves; then a stratum of fine-grained red and yellow sandstone with occasional fossils; then a stratum of rusty brown diabase, nearly a dekameter thick, and weathered into beautiful columns and forming a distinct projecting cornice supporting red sandstone like that at the foot, and above that beds of black, finely stratified clay shales, succeeded by a stratum of white limestone with ripple marks, and containing flat disks of ferruginous red marl, which are abundantly weathered out and lie scattered about.

On top of this lies another but thinner cornice of diabase, supporting strata of limestone in beautiful gray sheets, showing a tendency to crystalline form, the last layer forming the top of the mountain which stretches dreary and barren to the north.

Coprolites. A promontory farther south shows a different profile. This consists first of a bed of black bituminous shales, covered by thick diabase, with columnar jointing, and forming a wide plateau extending toward the east, and ending

in a steep precipice descending to a wide valley traversed by a brook, near which, once upon a time, a Swedish company attempted to manufacture coprolite into phosphate fertilizers. The slope toward the valley contains first diabase rock cleft and weathered; then a deep bed of bituminous finely laminated marl, containing quantities of spherical concretions of bituminous limestone, some of them of huge size; when weathered they roll down into the valley. These huge balls crack in all directions, the radiating lines filled with quartz crystals colored black with bituminous matter. When they are broken drops of asphalt appear, and enormous numbers of fossils—nautilus, halobia, monotis and other shells. Von Drasche's companion found in one the remains of a vertebrate of unknown determination.

Remains of Great Lizards. Baron von Nordenskjöld found in the Triassic, on the so-called Saurian Hook, the remains of saurians embedded in gray bituminous coprolite limestone. Their bones had been partly petrified into turquoise. He found saurians also at Whale Point and Cape Lee on the Stans Foreland, in the Triassic beds which are nearly three hundred and sixty-five meters thick. There again a Swedish company attempted to make artificial fertilizer from the coprolite but for various reasons was unsuccessful.

The Diabase of Spitsbergen. Both Von Drasche and Von Nordenskjöld made extended studies of the diabase of the Spitsbergen islands and came to somewhat differing conclusions regarding it. The Norwegian geologist thought that these rocks were metamorphic or tufa. The German argued that their crystalline structure and the dykes of the same structure as the beds proved the contrary. But Von Drasche was surprised at their similarity of mineral composition wherever found, even in quite dissimilar conditions; and at their persistency of type, both chemically and mineralogically, occurring through all epochs even down to Tertiary times, and in regions of hundreds of square kilometers of extent.

Jurassic rocks appear in various places, notably at Cape Agardh on the southeast shore of West Spitsbergen, where it

contains countless fossils and an injected stratum of diabase. In Advent Bay and between that and Sassen Bay, the diabase consists of fragments of gray crumbly marls and clayey blue sandstone, turned yellow by time. The marl contains spherical concretions of chert often surrounding crystals of chalcopyrite. The beds are generally well stratified. At Cape Starashchin they are tipped up on end. Von Drasche visited that coast in a boat, and discovered on the bottom black calcareous shales much foliated and containing scattered fossils generally covered with a thin shiny coating of a talc-like mineral. Sandstone overlies the limestone, and contains plant-remains altered to coal, alternating with compact quartz-conglomerate. Here also are small coal seams alternating with non-fossiliferous beds of limestone and sandstone.

Formations at Festningen. Nordenskjöld was the first to discover in 1872 cretaceous formations at Cape Starashchin, underlying almost perpendicular quartz rocks which contain spherical concretions as large as a man's head, and so remarkably resembling cannon-balls that the Norwegian sailors when they first saw them called the place Festningen, or the Fortress. These quartz cliffs are covered by a thin stratum of conglomerate, on which again lie black calcareous shales with fossil plant impressions, identical with those found in the cretaceous deposits of Greenland. On top of all are the Taxodian strata belonging to the Tertiary formations. These Taxodian beds appear again in Advent Bay. They are characterized by Miocene plant-remains and by various-sized seams of a brown and very pyritic coal unfit for boiler use.

3. A SCIENTIFIC PILGRIMAGE

Toward the end of July, 1910, the International Geologic Congress met in Stockholm. Arrangements were made for some of its members to visit Spitsbergen, which a poetic writer present called "the stronghold of Thor of the Hammer." Before the pilgrimage started they were treated to an exhibition illustrative of Spitsbergen geology gathered temporarily in

the Museum of the Swedish Geological Survey, and demonstrated by Professor A. G. Nathorst and Baron de Geer.

The party, representing England, Germany, Austria, France, Italy, Portugal, Switzerland, Denmark, Holland, Hungary, Norway, Sweden, Japan and the United States, went by train from Stockholm to Narvik, stopping first at Ragunda to note the marvellous object-lesson in land-formation made by the sudden draining of the great lake there; then they visited the enormous iron-mine at Kiruna in the Lapland wilderness, and various other points of geologic interest. They sailed north on the steamer *Aeolus;* as they had the good fortune to find Bear Island clear of fogs they ran close under its eastern side and were able to get some idea of its stratification, the sequence of the later Palaeozoic, Mesozoic, and Tertiary sediments, and its southern ridge of crushed ond altered Hecla Hook rocks mixed with fossiliferous Lower Silurian limestone. They could plainly see from the vessel some of the faults and strong unconformities which interrupt the strata of Devonian, Carboniferous, and marine Triassic rock, and the seams of Devonian coal.

As they approached Spitsbergen the ice-pack made considerable difficulty, but steering carefully and sturdily through the ice-lanes the little vessel "moved quietly, through a scene of dreamy splendor" into the ancient Behouden Haven or Safe Harbor.

During a week's stay the party penetrated into most of the recesses of the Ice Fjord. G. W. Lamplugh contributed to the December number of "Nature" an interesting account of this first scientific pilgrimage to Spitsbergen. A few passages will show what they found.

A Geologic Summary. "Though complex in details," he says, "the geology of central Spitsbergen is simple in its main outlines. Earth-movements of intensity, repeated at intervals down to Tertiary times, have ridged up the western margin of the island, bringing to light the oldest rocks and crumpling them along with the newer formations. These earth-waves, with their faults and overthrusts, subside east-

ward, leaving a high plateau of regular stratigraphy and gentle dips, which is sharply trenched by the branching fjord and its tributary valleys. On the north side of the fjord most of the valleys contain glaciers which reach the sea; but on the south side, owing to difference of aspect and other causes, the land-valleys are often empty nearly to their heads.

The Three Formations. "The high jagged outer ridge, at the entrance to Ice Fjord, consists of crumpled Hecla Hook rocks, succeeded eastward on the next ridges by sharply-folded and broken Carboniferous strata. But in the interior, the long northern branches of the fjord reveal a great mass of red Devonian rocks, very similar to our British Devonian, upon which the Carboniferous strata rest with strong unconformity and overlap. In upward succession, the Carboniferous limestones and cherts are followed by a belt of sandstones and shales, to which, on the somewhat scanty fossil evidence, a Permian age is assigned; and above these come the Triassic strata, chiefly shales or clays, with thin limestones, sandstones and phosphate-bands, often rich in well-preserved marine fossils.

"The outcrops of the three last-mentioned formations are narrowed to strips in the outer folded belt, but expand into wide tracts around the interior fjord. Then follow thick masses of the Jurassic and Tertiary sediments, for the most part gently dipping and in apparent, but unreal conformity, which build up the high picturesque plateaus on the south side of the inner fjord. These consist mainly of sandstones and shales of fresh-water or estuarine origin, but with occasional bands containing marine fossils. Both formations yield abundant well-developed plant remains, in striking contrast with the present diminutive Arctic flora; and both include coal-seams, at least one of which, in the Tertiary rocks, is likely to be of economic consequence."

Almost the first general expedition was that made to the region around Advent Bay.

A Pure White Coal Mine. "This," continues the writer, "has recently become a place of permanent habitation—the

only one in the ownerless land. Most of us were surprised at the display of engineering activity in such a remote corner, brought about by American enterprise in the development of a mine in the Tertiary coal. A shipping-wharf has been erected, to which the coal is brought from the mine high up on the hillside by skips traveling overhead on a cable. At the mine which we visited later, a seam of good quality, four feet thick, is worked by means of an adit. It was singular to see the walls of the workings all thickly encrusted with a sparkling layer of hoar-frost from the condensation of moisture on rock surfaces that are permanently below freezing point. A pure white coal-mine!"

The party divided into sections and visited various parts of the Ice Fjord; one went to the glacier-filled valley, south of Longyear City and either stayed on the moraine at a height of fifteen hundred feet and basked in the sunshine, enjoying the glorious view, or climbed to the summit of Mount Nordenskjöld (3460 feet). They had an opportunity to study the polygon-formations which are seen in such perfection on Spitsbergen. The other section went to see the Jurassic plant-beds on the other side of the inlet. Another day they crossed to Sassen Bay and examined the diabase, which there intrudes conspicuously in sheets among the sediments. Here they saw the shaly Triass creeping down the slopes in big, half-frozen mud-flows mixt with ice and blocks of diabase, and reminding the four English geologists of similar phenomena in England.

Composition of a Moraine. They visited Cape Bjona "under the fluted cliffs" of Temple Mountain and collected Carboniferous fossils, while the "glacialists" went to the head of the bay and studied the great Von Post glacier which had a sea-front three miles broad and was at the time retreating. Ice-falls from the blue-green precipice had caused in times past such tidal waves that they had carved out cliffs thirty or forty feet high; thus the investigators got a fine idea of the composition of the moraine.

"The red loamy clay of the sections," says Professor Lamplugh, "was studded, not too abundantly, with well-stri-

ated boulders of igneous and metamorphic rocks (from some unknown source beneath the glaciers) along with others, more numerous, of gray and red sandstones, conglomerate, chert, Carboniferous limestone and other sedimentary rocks."

Brightly-tinted Slopes. Still another phase in the stratigraphy of the region was found displayed in "the bare brightly-tinted slopes" of the inlet at the head of Klaas Billen Bay. Even from the vessel the party realized what a privilege they had in studying these object-lessons under the expert guidance of their learned leader. They visited also the mighty Nordenskjöld glacier "which breaks off with a sea-front of three miles in water reaching nearly five hundred feet in depth."

They had to return to Advent Bay for a fresh supply of coal and then they went to Ekman Bay and anchored at a spot which had within very recent times been beneath the great Sefström glacier:—

Erosion-Sculpture. "Above us, on opposite sides of the bay, rose the exquisitely-fretted edges of Mt. Colosseum (nineteen hundred and sixty feet) and Mount Capitoleum (two thousand, seven hundred and ninety feet), built up of nearly level Carboniferous rocks in tier after tier of belted crags, separated by high-pitched slopes and notched with amazing regularity by gullies and talus-cones. We had seen similar features again and again during previous days, but here, the sculpturing attained its greatest beauty, and the rhythm of light and shadow gave a well-nigh perfect impression of architectural design. It was just the typical sculpturing of an arid climate, reminding us of scenes in the 'Bad Lands' and cañons of Western America. In Spitsbergen also there is not sufficient precipitation to maintain permanent streams except those that have their source in melting snow and ice, so that the cones of frost-riven talus everywhere accumulate on the bare slopes above the ever-deepening main valleys."

The glacier itself, when first mapped by Baron de Geer in 1882, lay several miles back in a side valley. By 1896 it had advanced about four miles, and had grounded on Cora Island,

a mile or so from the opposite shore. It then was beginning again to retreat, generously doubling the size of the island by its deposit of moraine material, some of it fifty or sixty feet above sea-level, in a curved belt three miles long, a good deal of it scooped up from the clayey sea-bottom.

4. THE GREAT ICE AGE

If such changes take place within a space of less than a third of a century, it is easy to imagine what the rate of advance and retreat of the mighty belt of ice was, when, in ages past, it spread down over Russia as far as latitude forty-eight, over Scandinavia, North Germany, Holland, Scotland, Ireland, and most of England covering half of Europe and extending still farther south on the American Continent even as far as what is now New York City. There must have been a series of cold years, when the ice and snow collecting tended to make the seasons ever colder. During the Ice Age, the mighty glacier, perhaps thousands of feet thick, swept down across the lands, carrying with it huge boulders, plowing deep furrows, polishing off the sides and tops of hills, and leaving its traceries in finer and coarser lines on the rocks. Spitsbergen seems to give the object-lesson also of this tremendous drama of world-transformation. The same phenomena are found occurring on a smaller scale.

Red Snow. Perhaps the secret of its final cessation in the southern lands may be found in the deposit of what unscientific observers thought was "red snow." It is not snow at all, nor is it, as Scoresby and Martens thought, either a brownish stain brought down by streams or the mute of birds, not even of the little auk which stains red: but it is a kind of *alga* called *Haematococcus nivalis,* the composition of which has been chemically tested and found to contain a lipochrome in a cell surrounded by chlorophyll; it serves as a warmth-absorbing medium which keeps it alive in the recurring alternations of ever-melting and freezing. It is thought that it may have become a dominating factor in reducing the ice cap. "Possibly we are indebted to it," says Nordenskjöld, "that the ice desert

which once spread a frozen layer over Europe and America has given place to shadowy forests and waving grain fields."

De Geer estimates that it must have taken two or three thousand years for Scandinavia to become ice-free. Some geologists believe there were several ice-periods. The weight of the superimposed masses of ice and snow may have caused subsidence of the land; undoubtedly the ice—directly as gigantic plows, indirectly by the erosion of the torrents flowing from under them—hollowed out the fjords which are considerably deeper than the seas on the outside of the islands.

The Witness of Ice-Grooves. Professors Nathorst and Wilander discovered on Bear Island glacial grooves running from north to south in a coarse conglomerate, and concluded that since it was impossible for them to have been furrowed by any local glacier they must have been due to the great ice cap, and indicated that at that time Bear Island and Spitsbergen were united. Similarly it is suggested that solid ice may have filled the shallow sea to the west, and united with the sheet covering the Scotch Highlands. In America it reached farther south than it did in Europe.

The Witness of Boulders. When the Zeppelin expedition sailed north from Advent Bay and passed the vast glaciers which are the most striking feature of the coast beyond the Prince Charles Foreland, the *Mainz* took shelter in the Cross Bay from a raging tempest. Professor Miethe landed on the flat tundra, and was quick to notice how huge boulders had been brought down from the surrounding mountains and deposited here and there. As he stood on the shore, impressed by the almost absolute silence of the Arctic solitude, he began to picture to himself how in his native Germany the Ice Age, countless millenniums before, had perhaps presented a similar spectacle.

Glaciers then poured down from the Alps and broke off in the billows of the sea that covered the north of Germany. When a milder climate caused them to retire, the lower mountains became ice-free, and, after the tundra began to rise out of the water, the forest sprang up and spread all over the

land, which had been fertilized by the finely ground débris brought down by the ice.

A Vision of the Past. To Professor Miethe the scene on Spitsbergen evoked the vision of those long-vanished ages, and he depicts with considerable eloquence the aspect of Europe under the spell of the Ice Age: the great mass of the Alps rising above the Jurassic Sea, volcanoes belching forth lava to flow down hissing into the Lake of Constance, the vast ice-cap spreading out over the Scandinavian Highlands and Spitsbergen, curved and spotless like a giant shield, the bitter wind from the north blowing over the uninterrupted waste, while out on the ocean that breaks against its craggy walls and gnaws off great ice bergs, "tumble the nomad folk of the whales surrounded by countless flocks of sea fowl."

Thousands of years pass while the mighty plowshare of the ice crushes, grinds, overwhelms, drops its burden of rocks and sand. The bottom of the sea is pressed up and folded, and when it rises above the waves, it is furrowed by wild torrents which fill the lowlands with mud and build up deltas: "by the stagant pools mosses and lichens take root; matted heather, red cranberries, clubmoss, tall grasses follow; and one day for the first time appear the branched antlers of a herd of reindeer wandering over the low line of dunes, and the reindeer is followed by the aurochs and the schelch, which sneaks among the puny pines on the edge of the moorland."

Origin of the Ice Age. Scientists have advanced various theories to account for the phenomenon of such a period of glaciation. One of the most plausible is that the general temperature of the atmosphere was lowered by reason of a diminution of the carbonic acid, so abundant and so conducive to the rapid growth of vegetation at the end of the Tertiary Age. It was stored away in solid form in the coal-beds and oil-deposits so universally found in all parts of the world. Another theory attributes the Ice Age to the Precession of the Equinoxes. Whatever may have been the cause of its enormous extent, there are to be seen in Spitsbergen, as it were simultaneously existing, different stages of a similar Ice Age,

though of course on a much smaller scale. The same comparative presentation of finished eras is also one of the assets of Spitsbergen. Nowhere else are there finer object-lessons in the erosion of mountains by glacier-streams and by the grinding process of glaciers themselves.

Perhaps in the near future summer-schools for the study of practical science will be established in the vicinity of Spitsbergen's mining cities, or in the great International Park which the coming World-State will set apart for the advantage of its citizens!

The fossils found in great abundance in the sedimentary rocks in various parts of Spitsbergen have been carefully studied. They enable paleontologists to determine with considerable accuracy the succession of geologic ages represented there, connecting some of them with the Jura system of the Switzerland, and others with the crystalline schists of Bergen in Norway. Brachyopods in the sandy schists of Axel Island make it evident that the clay slate, marl-slate, and sandstone, lying above the permo-carboniferous series, belonged to the real Permian system. On one side of Temple Bay Nathorst found fuselina in blocks, and strata belonging to the cyahophyllum limestone series, which are common in China, Russia, and South America, but never before seen in Spitsbergen.

Great Trees in Spitsbergen. In the sandstone at Bell Sound are fossil plants which are attributed to the Miocene Period. Owing to the warmer temperature then prevailing large trees abounded, such as pines, poplars, beeches; and also the small-leaved lindens which now find their northern limit at Lake Winipeg, 29° south and only as small shrubs, while the American variety flourishes in swampy regions of Kentucky and Virginia, and as far north as Delaware, and in orchards in Switzerland; sequoias, oaks, plane-trees, spruces and the wonderful ginkgo-tree. At King's Bay (79° North Latitude) were found a large-leaved linden (or taxodia) and poplar, such as grew in Switzerland in the same age; but of ninety-three phanerogamous plants that grew in Spitsbergen,

only thirty-one have been found in Switzerland. It is thought that the Arctic Miocene flora, composed of similar trees to those growing in the Temperate Zone at the present time, may have spread as far north as the Pole, provided solid land existed there.

Varieties of Fossils. The Swedish Expedition which went to Spitsbergen about the beginning of the 'Sixties made known eighteen varieties of fossil plants. In 1868 Nordenskjöld, Malmgren and Nauckhoff collected twelve hundred specimens at Cape Starashchin, and five hundred at King's Bay: all of them were Miocene. Nordenskjöld brought from Advent Bay large pieces of lignite which cleaved into thin plates, containing carbonized wood, but he was unable to recognize any distinct plant. A piece of gray sandstone from the same place contained a tree-nut which proved to be of a species of walnut, the *juglans albula.*

The Profile of Cape Starashchin. Cape Starashchin presents an interesting profile: at the bottom there are round stones welded together with fossil wood and shell remains of native mollusks; then gray sandstone in thick strata, alternating with black shale and showing few plant-specimens; then a siderite or eisenspat stratum, gray intensifying to yellowish-brown; with carbonized plants such as are found in Greenland; then hard gray and brown or reddish-brown sandstone, with plant-remains determined as the *populus arctica,* a water lily and the swamp cypress; then a black shale with mica-scales and containing more than twenty per cent of bituminous coal and a large remainder of silicic acid, and clay with traces of iron, lime, and other materials corresponding to bituminous coal clay shale; it originated in a loam filled with mouldy and decomposed plants, and higher up changing to lignite, a shiny black coal like that of King's Bay and Alanekeroluk in Greenland. This is full of fossil plants, blossoms, fruit-seeds, small leaves, and the like, representing seventy-five different species.

Perished Insects. The black shale of Cape Starashchin yielded ninety-six species, including sequoia, taxodium, the cedar of Lebanon (*Libocedrus sabiana*), pines, oaks, planes,

hazel nuts, and the like. It was deposited in still water in an inlet of a prehistoric lake or peat bog. Here flourished and perished twenty-three species of insects, mostly coleoptera. Some geologists believe that the Miocene formation may have extended over the whole interior of Spitsbergen, and formed a vast continent stretching far to the south of Bell Sound.

There were few ferns and cryptogams, and the flora at that age was largely pine and cypress like that found in the north of Greenland. The poplar extended from Germany up to Spitsbergen.

One theory is that many important plant-types originated in Spitsbergen—such as the spruce (*Pinus abies*), the mountain fir (*Pinus montana*), and the swamp cypress.

Changing Sea-Level. Nathorst in his illustrated work on the Mesozoic Flora of Spitsbergen, published by the Swedish Academy of Sciences, advances the theory that the coal and plant-bearing beds of Cape Boheman represent the lowest layers of all the Jurassic strata of Spitsbergen. According to him, the occurrence of coal-measures corresponds to the transgression and recession of the sea. The Carboniferous layer begins with the plant-bearing culm-beds, then appears throughout the Permocarboniferous, Permian, and marine Trias. If the sea spread over the land then one would expect an older coal-formation in the upper Trias or in the lower Jurassic. These coal-beds seem to have been followed by marine layers. In the Upper Jurassic strata fossil plants are found with some coal and remains of fresh-water shells, probably indicating another recession of the sea, which once more for a shorter period covered the land; and one finds the Tertiary Transgression betrayed by plant-bearing strata over which are immense marine deposits, and on these again are strata of coal and plant-bearing rocks.

A Great Upheaval. In Schoonhoven or Recherche Bay there is an immense overturn which brought the flint of the mountain limestone of the Subcarboniferous Age above the Permian slate, and above that the spirifer limestone, which in turn lies under cyathophyllum lime and Ursa strata, in which

there are coal-growths. Nordenskjöld showed that the drift-wood, or Noahholz, which was found with the remains of mammoths on the islands of the northwest, had not risen in recent times as others had supposed. There is a very ancient formation of mud and sand, bright yellow and white, with seams of brown and black coal which contain charred stems and fossil leaves, proving that once a warm climate prevailed, just as when the Tertiary schists were formed in southern Spitsbergen. Nathorst also found coal to the west of Lars Hjerta's Mountain.

There is nothing more fascinating than to read the hieroglyphics which Nature carves into the solid leaves of her great book. "Daily," says Darwin, "it is forced home on the mind of the geologist that nothing, not even the wind that blows is so unstable as the level of the crust of the earth." It rises and falls like the billows of the ocean, but its oscillations may take thousands of years to be manifest or, as when earthquakes occur, they may be accomplished almost in a twinkling. To the geologist a thousand years is as a day.

The Presence of Coal. Dr. P. Couteaud, who visited Jan Mayen Land and Spitsbergen in 1892, contributed to the archives of the French Scientific and Literary Missions, published in Paris, an account of his discovery of coal on the southwest side of Advent Bay. The same had been remarked by the English yachtsman, James Lamont, described by him in his "Yachting in Arctic Seas (1876)," and rightly attributed to the early Tertiary Age, when, as it is now believed, the volcanic outburst spread basaltic lava over the primitive foundation of gneis in East Greenland, Iceland, the Faroë Islands, Scotland, and Ireland. The presence of the vast beds of coal proves that there must have been a luxuriant vegetation growing rapidly and quickly decaying, the deposits then heated under great pressure.

VI. THE BOTANIST IN SPITSBERGEN

1. PRESENT-DAY FLORA

THE PRESENT-DAY flora of Spitsbergen is of great interest to the botanist. Thorild Wulff thinks that the one hundred and twenty-five different species now known is not likely to be greatly increased: "As far as flowers and plants are concerned," he says, "it is a thoroughly explored land." Nevertheless the hope of adding one more variety tempts the explorer, very much as the depths of the skies fill the astronomer with the ambition to discover still another asteroid. One can never knew what may be found in some sheltered or isolated place. Occasionally under particularly favorable conditions where the sun shines warm, the vegetation is quite rich and abundant, especially under the cliffs where nest innumerable birds.

Nature's Hothouse. Professor Dr. Miethe tells of noticing from a distance a remarkable patch of vivid color on a declivity contrasting sharply with the gray environment. When he and his companions made their way to it over a stretch of deep moss he found that it consisted of bright sorrel, the golden Alpine poppy, white Hornkraut, and bushy buttercups with bluish-green leaves. He explained the abundance and vitality of these flowers by the fertilizer furnished by the innumerable flocks of birds that nest on the crags above. "The streams of water," he says, "which pour down the 'hanging moor' bring to it great quantities of mute from the nests, and this enriches the barren soil, which is also warmed by the decomposition of the turfy moss. Thus is created a natural and very effective hot-bed in the midst of Arctic surroundings."

Plants Blooming in Water. Scoresby noted on Spitsbergen forty-eight varieties of plants, such as the yellow potentillas, rock roses, white cuckoo pints, purple saxifrages,

campions, chickweed, and poppies. He was unable to identify eight of these plants. Most of them were dwarfish in character. The only tree he saw was a *salix,* or creeping willow: it grew to a height of only three or four inches.

A dwarf birch has been found on the east side of Coles Bay. Mr. J. M. Longyear attempted to bring back to America several specimens of this interesting treelet but they did not bear transplantation. Conway recognized certain flowers that he had seen blooming on the upper slopes of the Himalayas. Nathorst found a variety of polemonium growing in great abundance. Some of these Spitsbergen plants, unmindful of what Scoresby calls "the frigorific effect of the ice," are seen blooming in almost freezing water. The poppy and buttercup hardly wait for the snow to melt before they show signs of life. Nathorst came across a regular meadow full of luscious grass to the west of Frithjof's glacier. The horses and cows of the Arctic Coal Company found abundant pasturage at Longyear City. Such places are comparatively rare. There are two varieties of berry which have been known to ripen in favorable summers.

Rapidity of Growth. Owing to continuous daylight, vegetation ripens with considerable rapidity, coming to flower and seed in a month or six weeks. Buttercups and scurvy grass (*cochlearea*) reach their prime by June 20. Nathorst found the *arnica alpina* blooming on August 17. Chemical Botany is interested to note the different effects of sugar and starch in the leaves. At least sixteen different flowers, including the poppy (*papaver radicatus*), the buttercup (*ranunculus sulphureus*), and the saxifrage, betray the presence of sugar, which is produced by low temperature and absence of light. The anthocyans, produced from chlorophyll in the leaf and petal cells, are the cause of the brilliant colors in the Arctic plants. The *pedicularis hirsuta* is strong violet-blue throughout—leaves, stems, and stalk. The saxifrage (*opposita floria*) has green leaves with the under side reddish, while another kind of saxifrage (*flagellaris*) has a saffron-yellow blossom, but all the rest is a brilliant carmine; botanists

who have seen it growing on Spitsbergen regard it as the most beautiful example of the intensive development of red in the whole vegetable realm. The *stellaria longiphilis* is found showing a bright green where the ground is fertilized by birds; elsewhere on dry poor soil it is a reddish-violet.

All these little plants, growing under such adverse conditions, develop tiny chemical laboratories in which are evolved all the brilliant colors as the cell sap becomes neutral or alkaline.

Even the heat of the soil reflected up under the leaves has its effect. They change color as they advance in age, and function less vigorously. When the anthyocyan in the rim of the leaves becomes violet and the cells in the center are red, it is due to the difference in age, those outside being older and earlier developed. It is discovered that the continued light and the cold is destructive of the chlorophyll. The same phenomenon is noticeable in the mountain mosses, which show lovely colors because the membranes of leaf cells are dryer, while those flourishing in low flat places, in better soil, as on Vogelsang where there is a singularly rich vegetation, are green.

The Polygon Formation. Some of these mosses take root in the outline cracks of what is known to botanists as the polygon formation, called in Sweden Rutmark, and make a basis for the seeds of other Arctic plants to germinate. These cracks are formed by the drying of the surface after the snow water has evaporated or run off. Perhaps by the same law as causes snowflakes or the cells of honey bees, to take hexagonal shapes the drying cracks tend, if the soil is stationary, to form what the school boy called six-sided squares. The sides may be ten or twelve feet long, but in the course of time they are subdivided into smaller hexagons. The older the polygon the more abundant the vegetation, and occasionally they are found forming little oases of green.

Where the soil is particularly barren and stony the outlines are marked by regularly-sorted stones, the larger ones on the rims and smaller ones on the inside. On slopes, where the soil

is in a state of flux, the outlines tend to become long regular furrows or ridges. In case cotton grasses or other plants find lodgment, the roots are noticeable for their length, struggling thus to maintain a hold on the shifting ground.

Wulff's Thesis on the Rutmark. It may be worth while to note here what has been said about this phenomenon by other Nature observers since Scoresby first called attention to it. Thorild Wulff gives a careful description of it in the third part of a thesis for his Doctorate presented at the University of Lund and published there with a number of photographic plates in 1902. He spent a week in the interior portion of the East Fjord of Wijde Bay in August, 1899, and, though he was prevented by heavy weather and snowstorms from making extended excursions, he was fortunate enough to find himself in the immediate vicinity of a large tract of moorland or marsh exhibiting an ideal development of this peculiar formation. Oddly enough he remarks in a note that the honeycomb arrangement mentioned by Scoresby was not typical, though it would seem as if his critical doubt was based on very insufficient foundation, however justified he may be in complaining that current text-books of geographical botany pass the phenomenon over in complete silence.

He attributes to the Swedish botanist, Kjellman, the credit of being the first to call such curiously developed formations Rutmarken, and he cites in detail Kjellman's description of such a tract discovered during the Vega-Expedition along northern Siberia, and published by him in his "Scientific Observations" in 1882. He cites Kjellman's description in extenso, and here are a few passages:—

"Its most striking feature, which the name proposed for it aims to denote, is produced by intersecting cleavages which divide the upper strata of generally hard, dry earth, into compartments or lozenges of somewhat varied and often trifling size, and generally hexagonal in shape. Over this soil spreads the meager vegetation like a broadly-reticulated floral veil, leaving considerable areas quite bare. This meager vegetation finds a foothold only in the crevices and on the sides of the

hexagons, sometimes appearing in small scattered groups, sometimes in continuous narrow ribbands connecting at the angles of the figures."

Kjellman goes on to tell of the places where these formations are found most abundantly, and to note the character of the vegetation which makes them vary in different regions in Siberia.

Vegetations in the Polygons. Wulff found only one other detailed notice of the polygon ground, and that was in Baer's account of the expedition to Novaya Zemlya and Lapland, contributed in 1837 to the Scientific Bulletin of the St. Petersburg Academy. He noticed that when the débris of weathered rock collects in hollows, particularly when clay shale is the chief constituent, there resulted a darker loam, which, when it dried in summer, was cut up into hexagons by cleavages from one to three inches in width. In these furrows grew mosses which sometimes gradually spread over the polygons, and which furnished a foothold for other Northern plants such as cotton-grasses. This vegetation in the crannies marks off the hexagonal forms very distinctly. Schimper, in his "Plant Geography," gives a picture of a similar formation in the Highlands of the Pamir, but, as Wulff remarks, makes no reference to it in his text. A few others are instanced as having casually mentioned this geometrical formation of morass-surfaces; but Wulff himself goes into the question of its origin, and the comparative rarity of its appearance in absolutely typical Arctic development.

Origin of the Rutmark. At Wijde Bay he found his ideal of it and thus describes it:—"The place where the polygon ground here to be considered was found was a ravine stretching two or three miles toward the west along the west shore of the East Fjord, directly to the north of the colossal Mittag-Lefflers Glacier which forms the termination of the fjord. Toward the west the ravine was bordered by three mighty terminal glaciers, the precipitous ice-walls of which form a barrier shutting off the valley in that direction. The sides of the ravine were formed by very steep *fjelder* from 500 to 800

meters in height, and composed of metalliferous Devonian rock, an intensely red-brown slate predominating. This was here and there varied on the mountain side by a bright green metalliferous shale which, from its bright color, when observed from a distance might easily be mistaken for bands of luxuriant moss.

"Through the valley bottom flowed a great glacier stream, with many branches and contributary brooks of melted snow water, diagonally crossing the valley from the mountain-sides. As usually is the case in Spitsbergen, disintegration had completely splintered the mountain-walls so that they gave the appearance from bottom to top of one enormous heap of stones, and almost never presented the shale in an unbroken layer. This incredibly efficacious decomposition, and the constant dashing of water from the melting snow on the precipitous sides of the *fjelder,* caused the valley-bottom to be filled with enormous deposits of the products of erosion, those in the neighborhood of the precipices and along the impetuous torrents being composed of coarser boulders and gravel; but where the brooks in the spring spread out over the level ground an exceedingly minute mire was precipitated, and this was spread out especially at the mouth of the ravine in strata formed of impalpable red-brown mud.

"Now the polygon formation is found precisely on these flats constituted of the finest grained homogeneous erosion material. . . .

"When the spring freshets have passed their maximum and the water from the melted snow has shrunk back to the normal beds of the streams and torrents, the surface of the ground soon begins to dry up and becomes constantly harder, more compact and more rigid, and as the drying process continues, the ground, which is now hardened into a compact mass, can contract no more without breaking the cohesion among its particles. Long cracks therefore occur at the lines of the least resistance, and these cracks cross one another in such a way that three of them meet at one point with almost mathematical accuracy. The figures thus formed are for the most part

pentagons or hexagons. Those that are first formed as the ground dries are very large, the sides measuring several meters; indeed, I surveyed colossal polygons with sides as much as twenty meters in length.

"According as the drying process continues, new cracks extend from those first formed and divide the big ones into smaller and smaller ones; but this process comes to an end generally when the sides of the polygons have shrunken to two or three decimeters in size. The ground is then as smooth as a floor and so hard that one can walk on it without leaving the slightest footmark. As this system of cracks often extends without interruption over a space of several square kilometers, the surface presents a very peculiar appearance, and especially here on Wijde Bay where the coloring is a deep reddish-brown. We have the same effect only on a much smaller scale at home, whenever a stiff muddy soil cracks on drying out in the spring. . . .

Elevation of the Soil. "Year after year fresh erosion material pours over the surface and thus in time the flats are elevated, until finally they reach such an elevation that the spring freshet no longer spreads to such an extent over the level but now higher ground and are kept within the limits of the banks made along the brooks and streams. Then the even ground dries up permanently and the polygons remain unchanged from one year's end to another, only with greater development. The cracks grow deeper and vegetation can begin to find a lodgment. . . .

"Most botanists who have treated this subject of polygon ground are in agreement in considering the drying process as the factor instrumental in causing this formation (Kjellman, Baer, Warming). So it is difficult for me to see how G. Anderson (in his article on "The Life of Vegetation in Arctic Regions" in the *Nord. Tidskrift* for 1900) can argue that freezing plays an essential part in producing this phenomenon. It would certainly seem as if the cold by freezing the particles of soil together would only increase their cohesiveness while the formation of the system of cracks—and that is the main

question at issue—can scarcely be the result of any other factor than the process of drying."

Pseudo-polygon Ground. Wulff goes on to describe what he calls "Pseudo-polygon ground"; by this he means the arrangement of boulders and stones in loose hexagons. He explains its "quite illusory resemblance to a glacier" by its being formed of conglomerate detritus-material gathered by melting snow water into a mushy mass which slides down over a gently sloping substratum; but as its surface is constantly moving it generally allows no opportunity for vegetation to root in it.

At Wijde Bay the vegetation seemed to have been very slow in its growth, owing to the hard fight which vegetable organisms had to wage with weather conditions. Wulff says:—

"The irregular seed development, the slow growth of vegetation, and the precarious germination of Polar plants, of course enhance the difficulty of their migration to a soil newly opened up to vegetable life." He then goes on to enumerate the quite remarkable variety of mosses and lichens—no less than ten species of each differing in color and shape.

Salt Efflorscence. In 1911, Bertil Högbaum, during a long-journey, noticed a strange efflorescence of salt-crystals—the sulphate not the chloride of sodium—which settled in large thick coatings of crystal on the edges and angles or in the cracks of the polygon formations. As one looked down from the mine at Advent Bay the whole ground often appeared white or grayish-white, as if it were covered with hoar frost. He contributed to the bulletin of the Geological Institute of Upsala a monograph devoted to this peculiar phenomenon, trying to decide the question, "Whence came this salt?"

Its Origin. The natural answer would be that it was precipitated from the moist wind blowing in from the surrounding sea; but the climate in the neighborhood of the Ice Fjord and of Bell Sound is quite different from that on the west coast, where the relatively warm west wind striking on the high mountains is precipitated in the form of rain and

snow, and frequent fogs prevail, and where the winter snowfall is far greater.

Högbaum argues that it was not derived from present sea water, for on Cape Thordsen it is found at a height of thirty meters above the sea level, and as land elevation has for the present ceased, it must have been a long time since the salt water covered the locality. The salt-covered surface at the Braganza Bay occupies several square kilometers, and the ground consists mainly of talus glacier material formed in an ice-dammed lake. In Advent Bay and Bell Sound he thinks that the sandstones and shales of the Jura and Tertiary formations furnished the material for the salt-bearing soil. He also noticed on Cape Thordsen light coatings of salt on the rock walls of the Triassic very high up, and also separating out from the earth flow (*Fliesserde or solifluction*). The salty quality of the soil as well as the dry climate, the constant cold, and the flow or creeping of the earth from a higher to a lower level, make the land like a desert with many of the phenomena of the desert. He observed this on wide surfaces of the inner fjord-valleys and wrote:—

"Nevertheless it is peculiar that the salt is not leached out of the soil, especially when it is taken into consideration that at a depth of only two or more decimeters the ground is constantly frozen. To be sure the precipitation is slight and the draining away of the melting snow takes place while the surface is frost-bound; still it is difficult to explain in what way Nature manages to husband her supply of salt. It is possible that the processes take place in the frozen soil, whereby a supply of salt is brought up to the surface."

Lattice-Structure. Herre Högbaum was much impressed by the way in which the rocks and boulders of that desert region were sculptured by "weathering." The more friable parts were eaten out, leaving what he calls "lattice-structure" in the sandstone. There are great blocks of Jura sandstone, the surfaces of which are smooth and hard, while the interior is all eaten away. Granite boulders, however, are quite uninfluenced by these conditions. On Axel Island he

came upon a bank of sandstone marked by very beautiful latticed structure. Similar sculptures are found on Cape Conwentz on Braganza Bay, at the very end of Lowe Sound and in Advent Bay. It is supposed that salt-secretion was instrumental in producing these forms, which are found in the Jurassic as well as in the Tertiary sandstones. In many cases the blocks of stone lie on fluvial glacial ground and on the remains of moraines formed since the Mytilus time, and subsequent to the elevation of the land.

This spot on the Braganza Bay was chosen by the Russian colonists toward the end of the eighteenth century for their settlement, and remains of their huts abandoned at the beginning of the nineteenth century are still to be seen there.

Spitsbergen Flower Gardens. These are only specimen illustrations of the intriguing problems that fascinate the scientific man in the Arctic flower garden of Mother Nature. What the ordinary visitor may see is shown in a brief extract from a letter contributed by an anonymous tourist to the New York "Evening Post" in the summer of 1896. One paragraph is devoted to what the headline calls *"Artic* Flora." He mentions several of the rarest and most notable varieties of flowers that attracted his attention during his visit: the seldom seen *Koenigia Islandica,* the pretty white "reindeer flower" of the Norwegians (*Dryas octopetala*), and the white and yellow Arctic poppy (*papaver nudicaante*).

"Queen of all," he says, "undoubtedly is the *Andromeda tetragona,* a heath-like plant with white flowers, the shape and size of those of the lily-of-the-valley, and in many places the ground is literally carpeted with this beautiful flower. Brilliantly yellow and not to be overlooked on the dull, moss-grown slopes, are *potentilla verna* (Spring cinquefoil) and *Ranunculus nivalis,* while among the stones and the mud on the banks of the streams grows a diminutive buttercup, not to be distinguished by any one except a diligent searcher—the *Ranunculus pigmeus.* A beautiful and conspicuous flower is the *Itenhammaria maritima;* it grows upon the shore in trails, which always form more or less of a circle in shape, but vary much

in size. Sometimes the patch is a few inches across, sometimes half a yard or more. The flowers are a brilliant blue, and the leaves grayish and fleshy in texture; its name in Norwegian is Østersurt—oyster-plant—and anyone tasting the leaves will at once recognize the suitability of the name, although the flavor is certainly that of stale oysters. The rare Arctic birch (this will not be confounded with the dwarf birch) is also to be found here in Spitsbergen, though not at Advent Bay; while in a veritable flower garden on a little island in the Ice Fjord, where the North Fjord and Klaas Billen Bay meet, are to be found two species of fern, a *Cystopteris,* and a *Woodsia.*"

In general the vegetation is sparse. Owing to the extremely varied climatic conditions obtaining in the different, though often contiguous regions of Spitsbergen, vegetation may flourish in one place and be practically lacking in another. While on the north slope of the mountains the summer temperature may register as high as 15½° Centigrade, on the south side, just across some narrow bay it is always below freezing. Near Lake Ella and the Walrus Brook botanists have found the yellow Ranunculus, the red and white Saxifrage, white Cerastium, the yellow and white Draba, and Polar grasses and willows.

An excellent collection of the various plants that flourish or try to flourish—

> *"The curling tufts, the plumelets proudly nicked*
> *That make the cold their mother—"*

on Spitsbergen was made for the museum at Bergen by a Norwegian named Jörgensen. Many specimens of the fossils were brought to this country by Mr. J. M. Longyear, and presented by him to the Smithsonian Institute at Washington, Tufts College in Massachusetts, and the Michigan College of Mines at Houghton.

VII. THE FAUNA OF SPITSBERGEN

1. BIRD LIFE

AS SOON as the voyager approaches the shores of Bear Island he is invariably struck by the swarms of sea fowl that fly screaming and screeching around the ship. Herr Miethe, who gives a very vivid account of the grand desolation of this melancholy and terribly solemn forbidding land, says, "the only living things are the birds which nest in thousands, especially along the coast in the crags, or have settled down here and there on the bare formless hills like a swarm of torn white paper."

The naturalist Chapman who visited King's Bay speaks of the multitudes of birds seen by him there:—

"The teeming, hurrying, clamorous throng of sea fowl eddied round the lofty summits, dwarfed by the altitude to mere specks till they looked like ten thousand swarms of bees. Ceaselessly, day and night, the multitudinous columns plied between crag and sea; the upward-bound file with gaping bill and a cheekful of shrimps intended for their young, but often destined to become the prey of the Arctic skuas, which ever hovered ahead on piracy intent. The wild Babel-like medley of cries from the myriad throats round these cliffs, ceaselessly resounding in different cadences, resembled the distant roar of a heavy sea, or better perhaps, of an excited mob of the *ignobile vulgus* at election time. The buzzing and chattering of the guillemots, the weird long-drawn 'twit' of the auks, and the peculiar yapping bark of numberless Arctic foxes, each formed a part of this strange northern chorus."

Count Zedlitz's Experience. Otto Graf von Zedlitz und Trützschler, a well known German ornithologist, accompanied the Zeppelin expedition in 1910 and contributed to the stately volume descriptive of its activities, a graphic account

of the birds that he came across in a walk over the tundra at Advent Bay. The valley was threaded by innumerable brooks and rivulets from the melting snows but it looked to him like a marvelous carpet, white, red, and violet. Often the marsh was so yielding that he sank to his knees in slime. But he found a great charm in it.

"Now is the moment," he writes, "for the nature-lover to visit the tundra so as to be assured that even here Nature in her infinite sense of justice, provides a compensation. The pictures which for the most part are offered by the Arctic regions of changeless beetling crags, melancholy blue fjords, jagged glaciers and immeasurable stretches of inland ice are so overwhelming and solemn that they would crush the very soul did not other impressions of a sort rather softening and alluring than stern and grand calm the tension of our nerves. This feeling is induced by the summer like blooming tundra if we wander over it with open eyes and are tuned to the joy of life. To be sure the flowers are diminutive; the willows and mosses cling close to the ground; the characteristic representatives of the bird world are delicate; but yet this miniature world, which has such a friendly effect on us, beckons and invites: Stop and look at us."

The birds that he observed in this locality were the sandpiper (*Tringa maritima*), running with long bill and outstretched neck and ruffled feathers, looking like a brown feather ball on pretty yellow legs; crying *tüt, tüt* and trying to entice the stranger away from its nest hidden in some hollow lined with a few dry grasses among which lie four olive-green brown-spotted eggs; the short-billed red-legged ptarmigan (*Interpres strepsilas*) with its pretty black-white-reddish-brown plumage changing to pure white in the winter, for it does not migrate; the rather rare coot (*crymophilus fulicarius*) with its webbed feet and smooth bill; the great banded wader (*Charadrius hiaticula*) which is found all over the world but probably never farther north than here; the snow-bunting (*Passerina nivalis*), the only representative of the finches and the smallest bird on Spitsbergen; the robber

gull or skua (*Stercorarius parasiticus*) with its nest hidden between stones on a little island in a brook with two young ones scarcely distinguishable from the stones; the white grouse (*Lagopus hyperboreus*) and its family of seven half-fledged little ones; the tern or sea swallow (*Sterna macroura*) with its exceptionally large brood, the dark-speckled eggs a bright green or bluish-white, laid on the bare moss; and finally the barnacle-goose (*Branta bernicla*) and the eider duck (*Somateria spectabilis*).

He visited also the crags of the sharp-pointed mountains often perpendicular and impossible to climb except in some roundabout way, every rock, crag and pinnacle harboring its colony of fowl. He says of them:—

Birds at the Longyear Mine. "These gentry feel that they are the veritable lords of the mountains and utter loud objurgations if they are disturbed; but as a rule they are rarely molested by man. We proved this immediately on our visit at Advent Bay where of course the latest 'object of interest' on Spitsbergen—a coal mine in full operation—is on exhibition. Within pistol shot of us, above the mine shaft there is a something like a swarm of huge bees swirling around the crag. We have here a colony of auks or roach (*Alle alle*) the smallest species of the auks found in this region, and according to my observation it is just as numerous as it was on my first visit here ten years ago, when not a single human being was to be found where now the wooden houses of Longyear City shelter a hundred and fifty men.

"If the steam engine puffs, if the sound of hammers is heard in the mountain and car after car with its black freight rolls down to the valley, it makes no difference to our winged philosophers: they know that whoever attempts to reach their nests in the disintegrating stone which offers no secure hold or footing, would risk breaking his neck, and the worthy miners have no inclination for doing that, since their wages are high and there are far more enticing and attainable prey abundant and within reach.

"Our dwarf auks, called by the Norwegians Alkekonge

(German *Alkkönig*), can therefore increase and multiply without apprehension. So no wonder they pay little attention to human beings and prefer to turn their backsides to chance observers. Quite too comical looks a row of them, sitting on a ledge, side by side, stiff and erect, almost as broad as they are long, their shiny black backs turned to the visitor, while next the folded wings the white side feathers shine out very like two silver buttons on a dark dress coat, the whole exactly like the type of the small would-be-great, if we may for once dare jestingly to draw a comparison between man and bird, which of course would not be admissible in scientific preciseness."

The Great Auk is now wholly extinct: the inhabitants of Iceland knew it as the King of the Auks. It is represented only by the razor bill or Murre (*Alca torda*). High on the cliffs above Advent Bay breed the rare white-cheeked goose (*Branta leucopsis*), and in rather more accessible places the short-billed gray goose (*Anser brachyrhyncus*) both species of which fly down later into the fjord and then far out to sea with their young. The little ones have remarkable dexterity in climbing over the rocks and scuttling across the snow, and are equally alert as swimmers and divers. "I know no bird," says Von Sedlitz, "so many-sided in perpetual and active movement on land, in the water and in the air."

Advent Bay, however, is not so notable for its bird population as the regions farther to the north. He compares what he saw at the mine to a village; those on the coasts of the northwest and in the bays on the north coast to great cities, worthy of long months of study. With only limited time, however, he used his experienced eyes in making many interesting observations and focused his camera on remarkable groups and solitary specimens of these autochthonous inhabitants of the Isles.

"Bloody little," he says, beginning with that queer German slang-word, "is to be seen from below: like swarming bees the birds hover perpetually around the lofty and often white-tinted rock-pinnacles; but details cannot be distinguished; for that purpose one must fight one's way up and that entails hard work

for the *Genagelten,* and the ice-pick is essential. It offers a splendid opportunity for our treasured doctor [Seegert] to prove his Alpine expertness which he acquired in strenuous study at Munich; he undertakes the leadership as a specialist—and now forward and up!

A Risky Climb. "The steep grassy declivities are so slippery that the foot can nowhere find support; we steer clear of them as far as possible and for the most part clamber through a water-course which now, in late summer is almost dry and is filled with boulders. Soon they become large blocks, like little heads, down to those as big as fists, but without exception in a state of unstable equilibrium and quite too likely to turn over if you step on one. At every movement several of them go rolling and bounding down into the valley, so that you have to be doubly careful, first lest the one behind should not be painfully struck by them, secondly lest you yourself should not be painfully struck by them, thirdly lest you yourself should go tobogganing down involuntarly in a small avalanche.

"So it takes a long time to negotiate this difficult place before it is safe to look up. Far below our rowboat on the shore is diminished to a toy as it lies with the foam from the rising waves licking at it, then a section of the fjord almost motionless, dark green dotted with innumerable black specks—the backs of swimming auks. But it is still too soon to rest and gaze.

"The mingled cries from thickly populated ledges echo above our heads; the number of the birds flying back and forth is much more clearly recognizable—but still higher up—so onward! To the right and left the crags rise in perpendicular terraces many meters high, between them narrow clefts and bands barely wide enough for the foot, these often broken off but friable and without adequate points to clutch, so that the upper part of our runnel, utilized below, and now filled with old snow packed hard, offers the best aid in climbing. Step by step we go zigzagging up at an angle of 45° and even more. Where the foot finds no support in the icy snow the ice-

pick becomes necessary to make a path by digging out one firm step after another. Thus we advance, not rapidly, to be sure, but safely. In spite of the cool air and the light shooting jacket thrown open the sweat runs in a stream from the forehead, and we are filled with a keen sense of delight after so many days of lazy comfort on board our big ship!

"At last we are so well up that the enormous swarm of bees whirls close around our very heads; many indeed are below us. The welcoming cries give us a deadening obbligato; yet one soon becomes wonted to the monotonous tumult.

"On a narrow shelf of rock sparsely covered with grass we push forward cautiously to a vaster projection in the very midst of this screaming piping maelstrom of bird life, and pause to watch it.

The Mountain Dwellers. "All around, above, below, and close to us, and in long rows or in groups only a few meters distant, sit the mountain dwellers. Desirous as we were to reach one of the nests it was impossible to climb actually to it. The birds place their young in such a way that not even a very agile gymnast with only arms and legs but without wings could get to them. The birds know why they do so; they know that the fox, in his various Arctic varieties, has the greatest partiality for eggs and young fowl, and is therefore a permanent guest on bird mountains where he finds to his mind everything that such a clever jumper and climber can reach. Often the loot is so plentiful that he can hide a complete reserve in cold storage, as the credulous Norwegian huntsman persuades himself into believing. Mere man in such circumstances has no other recourse than to the rope if he will attain the nests."

Among the sea fowl which the Count observed and photographed were the guillemot or lumme (*Uria lomvia lomvia*), with its thick bill—the commonest variety of auk—and the tridactylous gull (*Rissa rissa rissa*), which resembles the stormy petrel of the North Sea. These two widely differing birds make common cause by nesting near one another, but not promiscuously. Not far away but higher up were the divers,

and then the tyste or teiste (*Cepphus grylle mandtii*), an almost wholly black auk with great white wing-eyes and red legs, nesting aloof from the others. There was the great burgomaster gull (*Larus glaucus*), snowy-white or silvery-gray, in spite of his beauty a buccaneer among the sea fowl, feasting on the eggs of the others, and even pouncing on the young ones as they swim on the fjord.

The number of these nesting birds is beyond estimate. If they are startled and swarm outward into the air, darkening the very sky, just as many seem to remain on the nests. By what instinct does the mother bird on returning from her flight instantly go to her own nest, never getting confused? It is one of the mysteries of Nature.

The Calving of a Glacier. On still another day the Count made a bird-hunting excursion on the ship-tender called affectionately *Tante Laura*. The morning (if there is such a time of day as the morning where day has no natural divisions!) was clear and cloudless but, as Lowell says,

"Down swept the chill wind from the mountain-peak,
From the snow five thousand winters old."

and the little steamer was sailing along about one hundred and fifty meters from a great glacier when suddenly the glacier "calved." A great mass of blue-green ice fell into the sea with a noise like thunder, and a vast column of spray flew up, causing a tidal wave which lifted the *Laura* like a cockle-shell. But it did not cause the slightest panic among the divers and teiste which were swimming on the fjord.

The Fulmar Gull. At a "glacier door" where a brook flowing from under the ice—"the dark flowing water of snow-fields" had formed a wide delta, and manifested its course far out in the fjord by the brown color of the red sandstone, there was an immense number of gulls, while hosts of seals stuck their black heads out of the water like swimming boys full of curiosity. Above, other gull-like birds, rather ugly, with their dull whitish-gray plumage and thick prominent beaks, were circling around in graceful curves, reminding one of skaters cutting difficult figures, and were recognized as the northern

representatives of the fulmar gulls, called by the Germans *Eissturmvogel.* There petrels are known to the Norwegians also as *Stormfugler;* the sailors call it the sea-horse (*søhest*) because of a peculiar way they have of partly running and partly flying on the surface of the water, particularly before taking flight. Their scientific name is *Fulmarus glacialis glacialis,* or by another nomenclature *Procellaria glacialis.* It is sometimes caught with a hook baited with fat and is eaten in "sea-pies." Once in the air, they breast fierce winds but they walk awkwardly. They collect in vast numbers around the huge bodies of flensed whales and feed greedily on the malodorous carrion. Their bite is considered dangerous.

The Arctic Parrot. On the water swam a large swarm of fowl, called by the Count "The strangest of all the Arctic birds"—the parrot divers (*Fratercula arctica glacialis*)—their plumage black above, white below, with big beak vividly variegated and a diminutive stub of a tail, and bright red legs situated so far in the rear that they are used to steer with when they fly. They nest far up in the hollows and deep clefts of the rocks, and are then difficult to find. The early visitors to Spitsbergen supposed them to be parrots, but they are in reality a kind of an auk or puffin.

Eider Ducks. On a little flat island in King's Bay are found the extremely rare swallow-tailed gulls (*Schwalbenschwanz Möwe: Xeema Sabinii*) and there, too, nests the northern eider duck one of whose scientific names carries with it a suggestion of the ancient myth of Ultima Thule, which Spitsbergen may have been to the ancients—(*Somateria mollissima thulensis* or *Anas molissima*) the mother-bird lays between stones or in ruts four large eggs of a muddy olive-green color, and covers them with soft down plucked from her own breast, making the nest look like a big fur cap. Trappers have been so unscrupulous in collecting the down and the eggs that in many parts of Spitsbergen they are no longer to be found, but occasionally the eiderdown is collected in quantities in deserted nests. The mother-bird looks after the family and stays on the eggs till one almost steps on them, then she flies away

with a sudden whir of wings, "not forgetting to leave a carte de visite on the eggs which thus uncovered are rendered by the acrid odor loathsome to the great egg-poacher, the fox, but not to the burgomaster gulls which are quick to seize such opportunities when the mother bird has been scared away." Meantime the father-birds, wholly oblivious of family obligations, fly off together in flocks far out to sea. They desert the islands at the approach of winter.

The Rare Ivory Gull. One of the desiderata of this excursion was the beautiful ivory gull, the old Norseman's *Isryp* (*Gavia alba*). It is regarded as "the fairest bird of the whole Arctic" and was first noted in 1773 by members of the Phipps Expedition. They haunt great glaciers and find food in the pack-ice, being easily lured by exposing remains of a seal in hollows of the ice. The red flesh attracts them from their distant observatories on towers of rock.

Count Zedlitz tried this trick with little hope of success because a dense fog had begun to sweep down from the *Jøkler* or inland ice, blotting out the sun and the landscape. A burgomaster came and began to feast on the seal, but "suddenly out of the fog appeared a dazzling white form somewhat larger than a dove—a graceful gull, its whole plumage both above and below gleaming snow-white, a true creature of the Arctic, its deep black feet, the red ring around its eyes, and its gay red and yellow bill brilliantly contrasting. This beautiful gull," continues the Count, "is a genuine robber and flesh-eater, and in this respect exhibits no sign of timidity: the report of a gun often attracts others and does not frighten away those near by."

The Red-Throated Loon. Owing to the fog the Count landed on a low stretch of country to visit some fresh water ponds that he knew were there and was rewarded by catching sight of the great diver or red-throated loon (*Urinator lumme*), the male, with its small head and sharp-pointed bill, sitting so low in the water as scarcely to be distinguishable, and near him his much more diminutive mate. By a clever maneuver he secured both of these timid birds and was dis-

appointed to find that they were not, as he had hoped, their cousin, the much rarer Diver with black and white neck. (*Colymbus glacialis?*) Conway devotes many paragraphs to the birds he saw; they seemed to shun the interior, confining themselves entirely to the coasts.

Scoresby's Account of Arctic Birds. Scoresby also in his two big volumes gives many interesting details regarding the Spitsbergen birds, attaching to them often a quite different battery of scientific names. He visited the islands so often that he saw many varieties missed by the Count in his hurried and limited excursions. He calls the sea swallow the great tern (*Sterna hirundo*), and gives its dimensions as fourteen inches including the tail, with a spread of wing thirty inches, so that it flies very high and has fierce battles with the Arctic gull. It lays its eggs on the shingly shore above high water. Scoresby also describes the *Colymbus troile* or Loon, giving it the sailors' name of "Foolish Guillemot" because of its clumsiness. It weighs about two pounds, is sixteen or seventeen inches long, with a twenty-eight inch wing-spread, has brown and black on back and arms, with a white belly, and sits upright like a penguin, but in the water swims and dives with great agility. The black guillemot is sometimes called the sea pigeon.

The Arctic gulls or skuas (*Larus parasiticus*) are the persecuters of the kittywakes (*Larus rissa*), pursuing them and snatching from them the morsels of blubber which they have. If a kittywake drops a piece the other catches it before it reaches the water. They are always on the wing. The skua has two tapering tail-feathers. Still another variety is distinguished by Scoresby—the black-toed gull or boatswain (*Larus crepidatus*), having tail-feathers shorter and not so pointed.

The Burgomaster Gull. He calls the ivory gull the snowbird or snow-grouse (*Larus eburneus, Pagophilaeburnea*), and gives the wing-measurement as three feet. He describes the burgomaster (*Larus glaucus*) as "a lordly bird—chief magistrate of the feathered tribe in the Spitsbergen regions, as none of its class dares dispute its authority, when

with unhesitating superiority it descends on its prey even though in the possession of another." It seldom alights in the water, but rests on ice-hummocks, and is to the last degree rapacious. It is twenty-eight inches long and has a five-foot wing-spread. Its back is bluish-gray, the rest white, the bill yellowish with a touch of red on the lower mandible. The snowy owl is reported to have been seen, also the razorbill or murre (*Alca torda*), sole representative of the Great Auk family.

Food Birds. Arctic birds are difficult to taxidermatize because their skins are so permeated with oil and fat that the arsenic has no effect, unless they are scraped. Most of the birds seen are not fit for food, the flesh being rank in taste. Sailors sometime soak the auk in salt water and find it fairly palatable. Baron Nordenskjöld gives a list of the edible birds found in Spitsbergen. The most important are the snipe (*Tringa maritima*), the snowcock (*Lagopus hyperborealis*), the gray goose (*Anser brachyrhynchus*), the Spitsbergen goose (*Brenta bernicla*), the two varieties of eider goose (*Somateria spectabilis* and *Somateria mollissima*), the red goose or crab diver (*Mergulus alle*), the auk or lomme (*Uria Brünnichii*), the teist (*Uria Mandtii*), the burgomaster (*Larus glaucus*), the storm bird or Mallemucke (*Procellaria glacialis*). If any of these birds have chanced to be feeding on flensed whales or dead seals their flesh is likely to be repugnant to cultivated tastes. But in ordinary conditions they afford an abundant and delicious food.

By the end of September or early in October the summer birds fly south and the foxes go into winter retreat, appearing again in late March, all ready to welcome their benefactors which come north in April. Thus the great shuttle in Nature's loom plies back and forth, weaving its marvellous fabric of life and death.

2. POLAR BEARS AND REINDEER

The Passion of Killing. "Our landing at Advent Bay," writes a visitor in 1896, "was signalized by an episode which

might have had disastrous consequences. The black head of what appeared to be a seal was observed above a slight rise in the ground a little distance off, and was immediately fired at by a young and eager Englishman. To the consternation of all parties, the head turned out to belong to a photographer hidden under the customary black velvet, but happily the sportsman missed his mark and the quarry was unharmed."

That was about a quarter of a century ago and Spitsbergen has been visited since then by thousands of Englishmen, whose one ruling passion, when out in Nature's wilds, is "to kill something," whether a Red Skin, a bear, a seal, or an ivory gull. Germans and Scandinavians are almost as prone to this destructive habit. The result has been, that without any control in the land, the game which used to be so abundant in Spitsbergen, is quite extinct in the accessible parts and becoming rarer and rarer even in the remote regions.

The Bane of Poison. In former days, large herds of reindeer roamed the valleys, wherever their favorite moss food was to be found. Accustomed to the noise of calving "icebergs" as the glaciers were first called, they paid no attention to the sharp reports of firearms and went on calmly feeding, hardly noticing even when one of their number fell. The Norwegian Government passed a law forbidding the sale of strychnine to huntsmen; but some of them managed to procure it in great quantities, and, regardless of the danger of poisoning the food which they themselves were after, they carried death and destruction to the flocks of deer and the foxes throughout the island. Travelers in the inland valleys have often found evidences of the ruthless disaster which such a short-sighted method of hunting has inflicted on the unfortunate animals—bones and antlers scattered in sad confusion over the moss and snow.

Formerly the huntsmen paid no attention to the meat of the reindeer unless they were obliged to winter on the island. As soon as an animal was killed and while it was still warm, it was "grallached," or skinned and beheaded. As it was generally summer time the antlers were "in velvet."

Polar Bears. Nearly all the early accounts of Spitsbergen mention the great white Polar bears. They rarely attacked human beings, but if brought to bay were dangerous, and many men, before and after Nelson's famous encounter, induced by his desire to carry a skin home to his father, have had narrow escapes.

The most famous bear fight occurred in 1668 when the crew of the Dutch ship, *Hoop van Walvischen*, engaged in flensing whales, saw a big bear on an ice-floe a little distance away. The captain, Jonge Kees, with two boats went out after him. He took to the water and the captain struck him with his lance. It did not immediately kill the beast, which, after swimming about climbed on another cake of floating ice. The captain followed and was about to fling another lance at him. But the bear with a leap of twenty-four feet knocked the lance out of the captain's hand and planted his fore-paws on the prostrate man's breast. The crew in one of the boats were unarmed but a man took a boat hook and ran to the captain's aid; at the same instant the other boat came up and frightened the bear away. He came so close that they could reach him with a lance but the captain was afraid he might spring into the boat and kill some of the men. He bade them not to thrust. Someone flung a stick of wood at the bear which ran after it "like a dog after a bone, growling horribly." Then eight men advanced toward him and followed him as he slowly gave way, showing his big white teeth. The captain flung another lance and missed his aim. The animal jumped from one cake to another, pursued by the men. Sir Martin Conway, who retells the story from Zordrager, who in turn took it without credit from P. P. v. S.'s volume of Dutch Whalers' yarns, entitled "De seldsame en noit gehoorde Walvisvangst" says, without due regard to correct English, "At last the brave beast's strength failed and he *laid* down and died."

The captain was henceforth known as "the Man under the Bear." He was inordinately proud of his exploit and when he became prosperous had a bas-relief of the incident carved in stone and placed over the front door of his house in Zaan-

dam. When the house was burned down in 1836, the work of art, broken into four pieces, was used for a time as ballast for a canal-boat; afterward it was built into the foundations of the new house erected on the site of the old one. Sir Martin Conway saw in the Zaandijk Museum a set of wine-glasses engraved with the same glorious scene and a go-cart used by Kees's grandchildren and decorated also with it; and he heard the story itself from the lips of one of Kees's descendants, whose grandfather indeed kept the identical skin of the redoutable bear that so nearly killed the brave captain and was said to have been the biggest pelt ever seen by any Dutchman of Zaandam. The Museum possesses also an oil-painting depicting the celebrated encounter and signed by Tet Roe, a painter says Sir Martin "not known to nor deserving of fame," and Sir Martin as Professor of Art at Cambridge ought to be a judge.

The Movies have been successful in showing Polar bears in action—swimming long distances under water and, in one case, where a cub was captured and suspended over the water, the mother bear in her frantic efforts to reach it actually leaped clear of the waves. The little bearlet was released and it was beautiful to see how Mother Medvyed swam away with it, manifesting every sign of joy.

But the Polar bears are becoming a rare sight on the west coast; one has to go far to the eastward into the foggy waters and along the ice bound shores of Edge Island or Barents Island to get a crack at one. The chance sportsman arriving on a tourist steamer, armed and accoutered for slaughter, finds now little to shoot at save only his fellow men prospecting for coal or for the precious metals.

Walrus and Seals. The great walrus (*Trichaecus rosmarus*), the sea-horse or morse of the early navigators—they used to congregate in herds of hundreds and even thousands and were killed indiscriminately for nothing but their shiny ivory teeth, but later for their blubber also and their skins which are made into mats, belting and the like, is now practically extinct. Their weight may be several tons; they are

from twelve to fifteen feet in length; their food is shrimps and young seals.

Seals are more frequently seen, though when shot by amateurs, who know little about them, they sink and never come up again. There are half a dozen varieties: the Jan Mayen or ringed seal (*Pusa foetida*), the snad (*Phoca vetulina*), the stor-kobbe (*Erignathus barbatus*), the hood-cap or crested seal (*Stemmatopus cristatus, phoca cristata*), which is found from six to twelve feet in length. One sometimes sees the saddleback (*Pagophilus groenlandicus*), and the smallest of all seals, the troll or gnome seal, which is only two or three feet long. A herd keeps one of its number on the watch for bears and other enemies; when they are alarmed they roll off into the water and disappear; but if cut off from escape are easily stunned by a blow on the snout. Seal oil is transparent and odorless and palatable.

The cessation of whale-boiling at Green Harbor has deprived that locality of an interesting but in every sense of the word trying spectacle. Few whales are seen in an ordinary trip to Spitsbergen but visitors have witnessed a battle between a huge whale and its enemy, the narwal (*monodon monoceros*) or sea-unicorn, with its single tooth lengthened into a long sharp tusk or horn. This may be driven nine or ten feet into the side of the great monster, which will almost instantly submerge itself and perhaps in its agony dive down a mile and "crack its jaw against the bottom." Those interested in the details of whale life will find them and much more in the volumes of Scoresby, who went north in the very heyday of ocean fishing.

The Coalfish. The waters of Spitsbergen have not been so thoroughly exploited for commercial edible fish as those near Iceland; but in time they probably will be found well stocked. The little steamer *Bjona,* chartered by Nathorst, was becalmed just south of Ice Fjord. One of the sailors threw out a line and in a short time caught forty cod, the longest measuring ninety-five centimeters. The only fish found by Lord Mulgrave on the shores of Spitsbergen, according to

William Yarrell, the ichthyologist, who died in 1868, was the coalfish (*Gadus carbonarius*), the name of which is certainly most appropriate. This species of cod has more aliases than any other inhabitants of the sea, for instance, the sillock, the pillock, the cooth, the barbin, the cudden, the sethe, the sey, and most splendid of all, the gray-lord. In Edinburgh and in the Frith of Forth the young coalfish are known as podleys, while at Newcastle on Tyne the fry bear the name of coalsey, and when they reach the size of a foot long are called poodlers. The dusky pigment of the skin soils the hands, and hence the name of coalfish: whether they feed on submarine coal-beds, Yarrell does not say; but it is not impossible, as they are voracious.

Salmon have been caught in some of the Spitsbergen streams and attempts have been made, though without great success, to do something with this form of sport, for instance at Green Harbor and at Lake Richard back of Redcliff Sound. Sharks abound in the Spitsbergen waters and a considerable number are captured every year. There are several varieties. A valuable oil is made from the liver. The lines are sunk to a depth of ninety-five fathoms.

VIII. SPITSBERGEN AND THE NORTH POLE

1. POLE-FISHING

THERE IS one kind of fishing which has rendered Spitsbergen notable: it might be termed Pole-fishing. Just as iron filings are compelled by an irresistible force to fly toward the poles of a magnet, so human beings have felt the necessity of seeking the North and South Poles of this earth of ours, which, according to recently developed theories, is an enormous magnet.

A Practicable Base. These attempts, which have continued during the past century and a half and have been attended by so many disasters, involve Spitsbergen, since it furnishes the nearest practicable "jumping-off place." On the northwest it extends almost to 80° of north latitude, while farther to the east it sweeps somewhat beyond that limit; and the Arctic Ocean, at certain seasons of favorable years, is navigable to less than six hundred miles of the Pole. How easy it would seem to cover that inconsiderable distance! Yet the hermit Pole ever remained unattainable.

Early Expeditions. The first purely geographic Arctic expedition was due to the interest excited by the Honorable Daines Barrington's memoir, "The Possibility of Approaching the North Pole," published in 1775. This was commanded by Constantine John Phipps, afterwards Lord Mulgrave. It got up as far as 80° 37′ North Latitude, was caught in the ice-pack, and narrowly escaped being wrecked. The ships spent some time in Fair Haven which was very inadequately and incorrectly surveyed, and also visited Smeerenburg Bay where in the vicinity of the old city they found four Dutch ships.

Parliament offered a reward of five thousand pounds sterling to any person who should sail beyond 89° of North Latitude but it was a safe offer: during forty-three years no one claimed it: Dr. Cook was not as yet aiming at the same goal!

Two simultaneous expeditions were undertaken in 1818. One of them consisting of two ships went to Spitsbergen and awaited in Magdalena Bay for the ice-pack to break up. They resurveyed and charted Fair Haven and made other excursions.

Accompanying the expedition was Lieutenant Beechey who made a number of sketches. On his return he "liberally presented them" to Henry Aston Barker, who had them copied in color on a large scale and exhibited in the rotunda of his panorama in Leicester Square, London. A small pamphlet, distributed to visitors, but now rather rare, gives a brief description of the predicament of the *Dorothea* and the *Trent*, and of the coast off which they were ice-bound for twenty-two days. As usual in such brochures some of the paragraphs are very naïve and amusing. Speaking of Spitsbergen it says:—

"Its shores at first present a true picture of dreariness and desolation: the principal objects which attract the attention are craggy mountains with their summits towering above the clouds; deep glens, filled with eternal snows, and stupendous icebergs. The eye, however, soon becomes familiarized to such a scene, and the mind is filled with admiration of the grandeur and magnificence of its objects." The pictures represent the ships in successive peril from storm and ice-pressure, and presiding over the scene are seals sporting on the ice, eider ducks, drakes and other birds. Polar bears, "groups of walrusses," and, in the background, a maze of mountains and bays, cliffs and glaciers. The notes refer to the birds and beasts depicted.

In an Act passed in 1818 Parliament offered a reward of five thousand pounds sterling to the owner of any merchant vessel or to the commander of any naval vessel that should approach within one degree of the North Pole. Various modifications and enhancements of this prize and of the one included in the same act (twenty thousand pounds for reaching the Pacific by the Northwest Passage) were made later, but no one ever received either of them. As the poet says:

"Stout explorers sought the Pole in vain."

Captain Scoresby scouted the idea that there was any land or open sea in the vicinity of the Pole. He rightly believed that the circumpolar waters are occupied by a perpetual sheet of ice which, from season to season, varies only by a few miles in the amount of the edge it presents, sometimes at its most accommodating mood retreating to the north of Spitsbergen, and then again sweeping far to the south. He declared that the project of reaching the Pole by sea was "altogether chimerical," but urged that it might be possible to reach the Pole by means of the ice itself.

Over the Ice Pack. "As the journey would not exceed one thousand, two hundred miles (six hundred miles each way)," he wrote, "it might be performed on sledges drawn by dogs or reindeer, or even on foot. Foot travelers would require to draw the apparatus and provisions necessary for the undertaking, on sledges by hand; and in this way, with good despatch, the journey would occupy at least two months; but with the assistance of dogs, it might probably be accomplished in a little less time. With favorable winds, great advantage might be derived from sails set upon the sledges; which sails, when the travelers were at rest, would serve for the erection of tents. Small vacancies in the ice would not prevent the journey, as the sledges could be adapted so as to answer the purpose of boats, nor would the unevenness of the ice, or the depth or softness of the snow, be an insurmountable difficulty, as journeys of near equal length, and under similar inconveniences, have been accomplished."

The Southward Current. What Scoresby did not foresee was the effect of the southward-moving current, carrying with it the ice-floe at a rate which would nullify the slow and laborious progress over the rough and hummock-covered surface. This was first discovered by Captain William Edward (afterwards Sir William) Phipps, in the last of his five Arctic expeditions, when with two boats provisioned for two months and ten days, he rowed from Hecla Cove in Treurenberg Bay, north as far as 81° 12′ 51″, where, on June 24, 1827, they began to haul the boats over the ice-cap, taking to water channels

wherever such occurred. How slow their progress—or rather their apparent progress—was, may be realized when it took the men two hours to go one hundred and fifty yards, the ice not only being full of hummocks but also covered with deep slush.

They spent forty-eight days on the floe, and yet failed to reach 83° of north latitude. Parry reckoned that they had traveled six hundred and sixty-eight statute miles, "being nearly sufficient to have reached the Pole in a direct line." They got back to the *Hecla* on the evening of August 21, and found it extricable, as by a miracle, not, as would have been the case in an ordinary season, ice-bound for the rest of the year.

A Myth Revived. The old myth of the Open Polar Sea was not killed by Scoresby's arguments against it. One of its revivers was Dr. Isaac Israel Hayes, who accompanied Dr. Elisha Kent Kane in his famous expedition in search of Franklin, in 1853, and who himself organized and carried out two other expeditions in the Sixties. He believed that a great ocean surrounded the Pole, and that this ocean had a diameter of at least two thousand miles, everywhere bounded by land at a uniform distance, and completely ice-locked in all directions.

"The reader," he says, "will observe that the long line of coast which gives lodgement to the Arctic nomads is interrupted in three principal places, and that through these the waters of the Polar Sea mingle with the waters of the Atlantic and Pacific Oceans, these breaks being Baffin's Bay, Behring's Straits, and the broader opening between Greenland and Nova Zembla; and if he traces the currents on the map and follows the Gulf Stream as it flows northward, pouring the warm waters of the Tropic Zone through the broad gateway east of Spitsbergen and forcing out a return current of cold waters to the west of Spitsbergen and through Davis Strait, he will very readily comprehend why in this incessant displacement of the waters of the Pole by the waters of the Equator the great body of the former is never chilled to within several degrees of the freezing point; and since it is probably as deep as it is almost

as broad, as the Atlantic between Europe and America, he will be prepared to understand that this vast body of water tempers the whole region with a warmth above that which is otherwise natural to it, and that the Almighty hand in the All-wise dispensation of His power, has thus placed a bar to its congelation, and he will read in this another symbol of Nature's great law of circulation, which, giving water to the parched earth and moisture to the air, moderates as well the temperature of the zones—cooling the Tropic with a current of water from the Frigid and warming the Frigid with a current of water from the Tropic."

Dr. Hayes argued from this that the Polar ice covers but a small part of the waters around the Pole and exists only where it is protected by the land. "It clings," he says, "to the coasts of Siberia and springing thence across Behring's Straits to America, it hugs the American shore, fills the narrow channels which drain the Polar waters into Baffin's Bay through the Parry Archipelago, crosses thence to Greenland, from Greenland to Spitsbergen, and from Spitsbergen to Nova Zembla,—thus investing the Pole in an uninterrupted land-clinging belt of ice, more or less broken in winter as in summer, and the fragments ever moving to and fro, though never widely separating, forming a barrier against which all the arts and energies of man have not hitherto prevailed."

Dr. Chavanne's Theory. Dr. Joseph Chavanne, who wrote in Germany about 1874, likewise believed that there was an open Polar Sea, and claimed that the Gulf Stream was the natural channel for high northern exploration. He showed how it ran between Bear Island and Novaya Zemlya, and turning to the northeast swept along the coast of Asia and united with the left arm of the Kuro Siwo, a branch extending along the west coast of Spitsbergen, and on arriving at the Seven Islands, diving under the cold Polar current, to come up again, like a bear or a whale, with the beneficent purpose of preventing the ice from forming around the Pole and perhaps clogging its revolution.

In the light of present day knowledge this mythical circum-

polar sea belongs to the same category as the theory that the Aurora Borealis is caused by the lubricating oil catching fire from friction and flaring up across the northern skies. It had to be relegated to the realm of fable together with the fertile lands scattered around above the Arctic Circle and inhabited by men whose heads grew under their shoulders and where flourished those weird "barnacles" which Gerard tells us in his "Herbal" are hatched out from white or russet shells growing on trees in the far North and, falling into the water, become geese!

Van Campen's Plea. In 1876 Samuel Richard Van Campen published in Amsterdam a two volume history of the achievements of the Dutch in the Arctic Seas. His aim was to stimulate Holland to take up once more the long-neglected enterprise of exploring the far North and, if possible, to win the glory of being first to plant its flag on the axis of the earth. At that time Holland was making preparations to drain the Zuyder Zee and embarking on other "stupendous" enterprises for the development of its home and colonial resources; he saw that it was unlikely that Polar expeditions would be launched by the Government, but he asks if it may not be "that some modern Plancius will come forth and persuade the wealthy merchants of Amsterdam themselves to fit out an expedition worthy of their great city."

Spitsbergen Urged as a Base. Van Campen advocated the attempt by way of Spitsbergen, and this route was also preferred by Professor August Petermann, the famous German geographer, while other equally eminent authorities argued for the advantages of the approach by way of Baffin's Bay and Smith's Sound, and still others saw that Bering Strait, through which runs the warm Japanese current, the Kuro Siwo, offered the surest and safest "Thermometric Gateway" to the beckoning and elusive goal.

This Open Polar Sea indeed enlisted among its advocates many great theorists and practical explorers and Baron Wrangell claimed that he saw, when he was sailing forty miles north of the coast of Siberia "a vast illimitable ocean." The

same illusion was cherished by later voyagers. Geographers went so far as to name this body of water, with its lanes rifting through floating ice-fields, Polynia.

Peary's Success, 1909. Others, of equal authority and perhaps greater practical experience, supported Captain Scoresby's opinion that the only hope of reaching the Pole was by using a ship or a base on the mainland, and thence sending a sledging expedition across the ice. This, as we know, was at last accomplished by Lieutenant Peary, who also definitely proved that Greenland was an island and discovered and named the most northerly of all northern capes, and finally, as the triumph of his eighth expedition, and the crown of his career, reached the Pole, together with a negro and four Eskimos, on April 6, 1909.

Earlier Attempts. Before that a number of other attempts to reach the Pole by way of Spitsbergen had been proposed or actually initiated. That of Torell, in 1861, was prevented by his having reached his base too late; that of Baron Nordenskjöld the next year had to be turned into an expedition to rescue ship-wrecked walrus-hunters off Northeast Land. The German expedition of 1871, conducted by Weyprecht and Von Payer, failed to find that the Gulf Stream would give them passage.

Wellman's First Trial. In 1894 Walter Wellman under the auspices of the New York "Herald," was sent to "conquer the Pole" by means of sledges crossing the Arctic ice-belt, as if Parry's experience had not sufficiently proved its impossibility. Accompanied by three other Americans, a number of Norwegian scientists, and a crew of sailors accustomed to Arctic travel, he set out for Spitsbergen, disregarding the warning that it was too early to get through the ice. It happened to be an unusually open season and their ship, the *Ragnvald Jarl,* made its way into the Danish Strait as he, following recent usage, incorrectly calls the Middle Gat, on the far northwest of West Spitsbergen. This was on May 10, "one of the earliest passages on record." He describes Spitsbergen in his book, "The Aerial Age" in a single paragraph:—

"Spitsbergen is an uninhabited group of islands, some of them quite large, lying between the seventy-sixth and eighty-first parallels of north latitude. It thus extends about three hundred and fifty statute miles north and south, and it has a breadth of about the same extent. It is true Arctic country. There is no foliage, save stunted brush in the southern part. The mountains are covered with eternal ice, and the valleys are filled with glaciers. Some grass grows in the sheltered parts during the short Arctic summer, and flowering poppies and mosses are seen here and there. Upon the mosses many herds of reindeer live."

Wellman found ready for his occupancy on Danes Island nearly opposite Deadman's Island, a house which had been constructed in Norway and erected almost on the very site where the whale-fishers of Harlingen and Stavoren erected their "cookery" in 1635. This rather luxurious establishment was maintained as a hunting-lodge by Alfred Pike, an Englishman who had spent a winter there and used it during many summers as a basis from which to make excursions in his own boat. At this time it was unoccupied and Wellman took possession of it, storing provisions in its outhouses, and leaving them in charge of a Norwegian scientist who desired to carry on geological researches in the vicinity.

A Newspaper Libel. When Wellman returned to civilization he was amazed to learn that the Press had charged him with having abandoned a poor Norwegian scientist to starvation! It seemed that a party of Englishmen on a hunting expedition had visited the camp in midsummer and found the Norwegian in good health but a bit lonely, and they reported that they had been obliged to give him supplies in order to save his life. "The facts were," says Wellman, "of course, that the poor abandoned man had a house full of the best food money could buy—enough to have kept a score of men a whole year—and the only supplies his English visitors had given him to save him from starvation was a case of Scotch whiskey, not a drop of which was left by the time we were able to get back to the depot."

Wrecked in the Ice. They sailed as far north as the Seven Islands, and prepared to make their way over the ice-pack, which was only a few miles nearer the Pole. They were furnished with sledges and about forty draft-dogs, such as are used in Belgium and Holland. They had also two aluminum boats. While they were trying to find an acceptable place to break across this Polar ice a tremendous storm arose and the pack-ice, driven with irresistible force against the land, wrecked their ship on Walden Island near the spot where the great Nelson, when a boy, had had his famous encounter with a Polar bear. It was sheltered, as the captain, an experienced navigator, supposed, in safety behind a tongue of heavy ice. The tongue gave way and the *Ragnvald Jarl* was crushed like an egg-shell. The crew got some of the timbers and canvas to the shore and erected a shelter, and, as they salvaged some of the stores, were comparatively comfortable. They sent messengers after Wellman, who immediately returned and rescued his trunk which contained valuable papers and his evening dress, which he had decided not to wear however appropriate it might be in his visit to the Pole.

He despatched Captain Bottolfsen to the south to find another ship and then took up again his treck across the pack-ice. Pulling their heavy sledges and their boats and finding the dogs utterly useless so that he had to shoot them all, he and his party crept along the rough shore-ice as far as Cape Platen at the northernmost extremity of Prince Oscar's Land on Northeast Spitsbergen, trying all the time to find a possible way of crossing the mountainous heaps of drift-ice which had been crushed up against the land. Here he established a camp out of the abundant drift-wood that had been brought across from the rivers of Siberia. Finding it an impossible task to get out on the supposedly level ice-pack and make a bee line, or more appropriately a magnetic line for the Pole, Wellman and his companions were obliged to struggle back to their improvised camp on Walden Island, the southernmost of the Seven Islands. The conditions for travel were almost impossible; sometimes they had to push their boats through slush which kept them

wet to the skin for days at a time; occasionally finding open pools where the boats would make some natural progress. One day one of the Norwegians, in jumping from one floe to another, broke a bone in his foot and had to be conveyed by the others.

It took some weeks of this arduous and exciting toil before they rejoined their companions, whom they found in perfect condition. As the ice showed no inclination to permit the approach of a vessel, they decided to man the two aluminum boats and several heavy life-boats which had been saved from the wreck of the *Ragnvald Jarl,* and started to follow him. They had many desperate encounters with icebergs and other floating masses, and many times they narrowly escaped disaster.

Suggestion of a Balloon Journey. While engaged in this battle for their lives, it occurred to Wellman that it might be possible by means of a balloon to take advantage of the southerly winds, and, starting from Spitsbergen, with three or four men and dogs with sledges, get to the Pole with comparatively little difficulty. Accordingly, after he had succeeded in effecting their rescue by means of a sealing schooner which they discovered at the edge of the ice-pack, and which conveyed the party to the Pike House on Houcker Bay which he calls Virgo Bay, he returned to Paris and entered into negotiations with Godard et Sourcouf to build for him a balloon capable of lifting a total weight of fifteen thousand pounds.

The cost, however, was about $100,000 and it was a question how to raise it. It happened that his friend, Herman Henry Kohlsaat, who had recently sold his interest in the Chicago "Inter-Ocean" and various parcels of real estate, was in Paris with "a cool million" which he was willing to spend after the fashion of a modern Maecenas. He had known of Wellman's Arctic plans and would have gladly financed the expensive undertaking. Wellman knew nothing of Mr. Kohlsaat's presence in Paris, having neglected to register at the office of the New York "Herald," and they did not meet.

Andrée's Similar Scheme. Ballooning to the Pole must have been in the air: for about this same time, S. A. Andrée, a Swedish electrical engineer who had wintered at the Swedish Meteorological Observatory at Cape Thordsen twelve or thirteen years previously, was preparing to seek the Pole by means of a balloon. His scheme attracted favorable attention; funds were furnished by King Oscar, Alfred Nobel, the millionaire nitro-glycerine and dynamite manufacturer, Baron Oskar Dickson, and others. The steamer *Virgo* sailed from Göteborg in June, 1896, carrying Andrée and his balloon, the *Eagle,* supplied with a ton of compressed food, including champagne and claret.

The base chosen for the proposed start was on the north side of Danes Island near the old vanished Smeerenburg. Once more Arnold Pike's shooting lodge was occupied for the purposes of a greater hunting expedition. Conway visited him there and was surprised at the size of his balloon but then he says "all balloons are larger than you would suppose!" Of course, as the balloon was to float without other motive power than the wind, a south wind was essential and even if it were moderate, only three days of it would be needed; but Andrée waited in vain for it to blow from that quarter and when the middle of August arrived he abandoned the attempt for that year.

The Loss of Andrée. In May, 1897, Andrée, having enlarged his balloon to a capacity of one hundred and seventy-two thousand cubic feet, started north on the *Virgo,* again convoyed by the Swedish gunboat *Svenskund.* On July 11, the balloon, with a lighter load of provisions than before and carrying thirty carrier-pigeons, began its venturesome quest. It carried besides Andrée, two Swedes, N. Strindberg and K. Fraenkel.

One of the pigeons loosed two days later arrived reporting the balloon's attainment of latitude eighty-two. What became of the adventurous aeronauts is still unknown, though Professor Nathorst undertook an expedition in search of them the same year, and other attempts were made to solve the

mystery. An account of the Andrée attempt was contributed to the "Century" magazine by Jonas Stadling some months later. A marked buoy from the *Eagle* was picked up on the coast of Iceland in July, 1900, and another the next month on the coast of Norway. Floating ice may sometime, even after many years, bring back the gruesome answer to the question, What became of Andrée and his two companions?

Wellman Tries Sledges Again. Wellman still cherished his design of reaching the Pole. Discouraged by the difficulty of raising the necessary funds, and seeing the risks of entrusting himself to a balloon driven by fickle winds as shown by Andrée's tragic fate, he returned to his plan of using sledges and crossing the Arctic ice-belt. For this he secured ample funds, and in the Spring of 1889, chartered the ice steamer *Frithjof,* at Tromsø, and with a party of Americans and Norwegians sailed for Franz Josef Land, which lies northeast of Spitsbergen. At Arkhangelsk they shipped a team of eighty-three draft-dogs which Alexander Trontheim of Tobolsk had driven across from the mouth of the Obi River, a thousand miles. Wellman wrote in his diary:—

"It is only by sledging that anyone now proposes to reach the North Pole. The old idea of an open polar sea and the navigation of the very top of our earth in a ship is abandoned. After Andrée's disastrous attempt to find a royal aeronautic road to the Pole, no one else is likely to try that method."

His attempt this time was more disastrous than that of three years previous. He spent the winter in a special house brought in sections from England for the Jackson-Harmsworth expedition and reinforced with two outer shells each separated by air-spaces, and the whole covered with "Arctic marble," as they called the slabs of snow used for that purpose.

On February 18 he started out for Fort McKinley on Cape Tegetthof, where Paul Bjørvik and another Norwegian named Jonsen had been left during the winter to be ready for them in the spring. Bjørvik was the man who ten years earlier, while one of the crew of Nansen's *Fram,* had wintered with one companion named Bentson in Franz Josef Land. His

companion had died of scurvy, in his last lucid moments begging him not to expose his body to the bears, and for three months Bjørvik had lived alone with that dead body, preserving his mental serenity, singing to cheer himself, writing his diary, and subsisting on wild game.

Captain Bjørvik. This time again he was left alone, Jonsen, toward the end of the winter, having fallen through the ice and drowned. Again he pulled himself together and was found well and as happy as a man could be under the circumstances. Though well along in years he accompanied the Zeppelin expedition, and was also a member of Mr. John M. Longyear's bear hunting trip to the east of Spitsbergen. Professor Miethe praises his indefatigable activity in organizing and conducting hunting parties from the *Mainz,* in harpooning and salvaging seals before they sank, and then flensing them, with occasional outbursts of eloquent profanity.

"For Bjørvik," he writes, "our experiences are nothing unusual and the whole trip is merely an idyll in his thoroughly multifarious Polar existence which has for fifty years or so almost completely filled his life. As he has taken part in numberless expeditions of the most varied character, attended by the most contrary fortunes on the waters of the Northern Ocean as well as those of stormy far southern latitudes, which, in company with our present oceanographer, he crossed on the *Gauss.* He has overwintered on Spitsbergen and on Franz Josef Land, besides he has been everywhere and there is nothing that awakens the least fear in his mind. . . . His weather-beaten face, framed in rough, whitening red beard, expresses only genial content."

Further Disasters. From Fort McKinley, Wellman, on March 17, set forth again with forty-five men and the dogs. For eleven successive days they had a temperature ranging from 40° to 48° below zero. At night they slept four in a bag; when one turned over all the rest had to do the same. The heat of their bodies soon melted whatever ice had formed and they frequently found themselves lying in pools of water. Under enormous difficulties they pushed on; but on March 20,

the very day when they expected the almanac to fulfil its promise of bringing the face of the sun up over the southern horizon, Wellman nearly broke his leg in an ice-crack over which he was trying to force his sledge with the aid of his dogs. Indomitably he kept on his northerly way, his leg growing worse all the time. Two days later came what he called "an ice quake." A great crack opened directly under their sleeping-bags. The men and two-thirds of their dogs managed to escape drowning by climbing on a neighboring floe, dragging three of their sledges with them. Their other dogs, all the dog food with several hundred pounds of their own provisions and their canvas canoe, their instruments, and reserve clothing were lost. A storm had set the whole ice-field into motion and an iceberg rising about forty feet above the surface and grounded on the bottom in perhaps one hundred and fifty feet of water had sawed it in two exactly in the line of their night camp.

"All along the coast," wrote Wellman in his diary, "as far as we could see this bright morning, the one spot—the one little rood out of all these millions of acres—where our camp could have been pitched only to be destroyed was the very spot where it had been pitched. All other spots for miles and miles were just as they had been."

Their northward journey was at an end and Wellman says that in his bitter disappointment he wept. They had to turn back. Wellman's leg swelled and prevented him from walking. The cold was terrific. Once a big bear walked in upon them expecting to make a meal of them. They made a number of meals of him and had plenty of fresh meat for the dogs. At last Wellman got back to Fort McKinley again and found the rest of the party at Harmsworth House, where for fifteen weeks he was attended by Dr. Eward Hofman, while Mr. Evelyn Baldwin of the United States Coast Survey, an able meteorologist, with some of the Norwegians delimited the Archipelago to the northeast and corrected the maps made by previous discoverers. Wellman distributed the names of his friends and patrons among the new islands. Unfortunately,

two of them were afterwards found to be only ice humps and not solid rock. Probably by this time Cable and Johnson Islands have drifted down into warmer waters and disappeared.

The Duke of the Abruzzi. Wellman's brother, Arthur, soon appeared in the steamship *Capella* and as they sailed out of Franz Josef Land they met the *Stella Polare* which had brought up the Duke of the Abruzzi, equally with himself untaught by Parry's experience, determined to make an onslaught on the Pole by means of sledges traveling across the southward-advancing ice. The Duke lost several of his fingers by frost-bite and was obliged to give up the effort. His and Wellman's sledging expeditions, were the last attempts to accomplish the impossible by means of the ice-route from Spitsbergen. The Duke's valorous battle with the forces of the North are related in two stately volumes finely illustrated, and may be found translated into English.

New Schemes On Wellman's return he decided that the Pole would not be attained by the primitive sledge and by brute force. It occurred to him that, since a motor car was unavailable on account of the roughness of the way, a motor sledge might be devised, or rather a small locomotive weighing a hundred and fifty or two hundred pounds and so constructed as to drag a line of sledges in which men could be carried with all their provisions. When such a convoy reached the hummocks caused by the grinding together of the continually shifting ice-floes which make up the ice-pack, the men, not exhausted by pulling and hauling and by other discomforts, would be able to drag it over them. He made some experiments but while still engaged on them he heard of the practical success of the Lebaudy dirigible balloon which had been adopted as a military machine by the French Government.

A Dirigible Balloon. In January, 1906, he went to Paris and held consultations with various scientific men, interested in aeronautics; he then contracted for the construction of the second largest airship ever made. After various vexatious delays and mistakes, some of them owing to strikes in the establishments of companies on whom he depended for

building the airship, it was completed and despatched to Danes Island, where a great hangar had been constructed in large part from the remains of Andrée's ruined balloon-house. In order to make room for it, the precipice back of the site had to be blasted away. The dimensions of the dirigible were one hundred and eighty-five feet in length; greatest diameter, fifty-two feet; volume, two hundred fifty-eight thousand, five hundred cubic feet; total lifting force at sea level, nineteen thousand pounds. It carried a steel car one hundred and fifteen feet long and supporting a steel reservoir capable of holding one thousand, two hundred gallons of gasolene. It was driven by two steel screws each eleven feet in diameter, and connected to a Lorraine-Dietrich engine of between seventy and eighty horse-power capable of running at the rate of eighteen miles an hour. It was reckoned that even if the wind blew against it at the rate of ten miles an hour they could travel nine hundred and sixty miles in one hundred and twenty hours, or two hundred and forty-three miles beyond the Pole. It was to carry beside the crew, ten sledge dogs, sledges, a small boat, and several months' provisions.

Wellman's project was discussed by many newspapers, and was generally regarded in America as a clever advertising dodge on the part of the Chicago "Journal," by which it was financed, and for which the expedition was named. But scientific men believed in it, and Professor Janssen of the Paris Observatory said that whereas Andrée's voyage was suicide, this one promised success." One editor who attacked the scheme spoke of Smeerenberg "as a populous city" where there was an abundance of laborers! Laborers at that time were scarce at Smeerenburg and those that went up to Danes Island had to be engaged in Norway.

A Scientific Village in the Arctic. Camp Wellman, proudly boasting of being "a scientific village in the Arctics," became a scene of busy labors. The great hangar, which was two hundred and ten feet long by eighty-five feet high and covered with nearly an acre of canvas vied, with the ruins of the unfortunate Andrée's balloon-house in attracting visits

from tourist ships which poured forth on the island hundreds of inquisitive sightseers. Among those that came was Herr Otto von Gottberg, the representative of the Berlin "Lokal-Anzeiger," who had been sent in a small chartered boat to report the results of the expedition. This was perhaps a scheme of the German Government to get possession of the North Pole as a part of their mad ambition to be masters of the whole world. But Wellman made the party welcome. The Prince of Monaco also put in there in his sumptuous scientific yacht, the *Princesse Alice,* on which he was making investigations in the seas and on the shores of Spitsbergen. He had with him Professor Hergesell, of Berlin, who was engaged in exploring the currents and conditions of the upper air by means of captive balloons. Professor Hergesell told Wellman that if he ascended about two miles he would get into an air current which would take him toward the north at the rate of two hundred miles an hour, but that the temperature would be from 70° to 80° below zero. Such a temperature would very materially reduce the lifting power of the balloon, since a fall of 20° diminishes it about a thousand pounds.

A Drag Serpent. Wellman used what he called an "equilibrator" to take the place of ballast: it consisted of a long, flexible steel cylinder of leather, water tight, and carrying in it about eight hundred pounds' weight of reserve food for the crew. He had also a kind of stuffed anchor which they called a "serpent" or "sausage," covered with steel scales and attached to a cable; when needed for use it could be thrown overboard to drag along the ground or over the ice.

He postponed his first flight till the following year and spent the winter in Paris where he made many flights over the city and the surrounding country in an ordinary balloon. The following June he was back at Danes Island again but owing to unfavorable weather-conditions had to postpone until September 2, his first trial trip, in which he and two others participated. They were watched by a party of German officers who had arrived for that purpose on a small steamer.

The Genius of the North Pole immediately sent against them a strong northwest wind, accompanied by snow, which drove them against the mountains, and they were obliged to slit the gas-bag; but they landed safely after an exciting and very perilous experience.

The Fiasco of the "America." In 1909, he made his second essay. When he reached Danes Island he found that the hangar had been wrecked by winter storms; he was obliged to rebuild it. With a force of twenty mechanics it was ready for occupancy by the middle of August, and the *America,* somewhat enlarged and refitted, and provided with two complete motors and driving systems, was inflated and installed. On August 15 they started for the second time. At first all went well and they reckoned that in thirty hours they would be at the Pole, where only nineteen weeks before, though they knew it not, Peary had already planted the American flag.

While everything seemed to be working favorably an accident occurred: the "serpent" containing their extra food and various other necessities, and dragging on the ice, suddenly broke away a few feet from the ship and carried with it the entire length of the cable to which it was attached. Relieved of its weight the *America* shot up into the air. Before they could pull the valve rope and let out enough hydrogen to descend they had one grand view of the northern coast of Spitsbergen. They were obliged to turn back against a strong southwest wind. After a desperate struggle the airship fell into the sea. Wellman and his companions were just taking to the boats when the *Farm,* with Captain Isachsen, hove in sight and rescued them, taking the dirigible in tow. In getting it up on the beach a guest of wind upset the gas-bag, tore it from the car, and sent it high into the air where it exploded. They had made a voyage of at least one hundred and twenty miles and engaged in all those exciting adventures all in one day!

Dr. Cook's Stolen Triumph. Before returning to Norway, Wellman enlarged his hangar with the intention of once

again making the venture, and with a new and improved air-ship; but as he was sailing down the coast of Norway a telegram was handed him announcing that "Doctor Frederick A. Cook, an American, had reached the North Pole." When he reached Copenhagen two days later, that audacious adventurer was the lion of the city; but Wellman knew from the inherent evidence of his story that he had not been anywhere near the Pole. He refused to meet him and was consequently bitterly assailed by the newspapers that were friendly to Cook.

Attempted Flight Across the Atlantic. The news of Peary's conquest of the Pole, arriving a few weeks later, put an end to Wellman's efforts in that direction. He undertook to cross the Atlantic in a new *America*. Here again he was handicapped by faulty workmanship and motors which failed to work. After a three days' voyage, attended by many narrow escapes, the great airship was abandoned, and floated off to its ocean grave somewhere near the Bahamas. He and his crew of five men and the cat were picked up and brought back to New York, still undaunted and strong in the faith that sometime that great undertaking would be accomplished as indeed it has been, though with a different kind of air-ship. Who can doubt that if it had not been for the desolating war, it would long ere this have been performed by a peaceful Zeppelin?

The Zeppelin Expedition. In the sumer of 1910 Count Zeppelin himself, accompanied by Prince Heinrich of Prussia and a distinguished party of German scientists, went to Spitsbergen on the North German Lloyd steamship *Mainz* for the purpose of selecting a suitable *Ausgangspunkt for* a dash to the Pole on a dirigible. One gloomy, foggy day the *Mainz,* anchored between Danes and Amsterdam Islands, and half a dozen of the passengers paid a visit to the spot made memorable by Andrée and Wellman. The Germans could not understand how it happened that both the enthusiastic young Swedish "idealist" and the American "advertisement-hero" should have pitched upon a site so comfortless, so forlorn, so shut in by steep wild barren crags, and exposed to the full force of

the fierce north and northwest winds—a place entirely unsuitable and foredoomed to cause failure.

This was the scene presented to their eyes: Andrée's great balloon-house now quite flat but still visible at the foot of the lofty guardian mountains separated by valleys each harboring patches of snow and ice; the white ghostly skeleton of Wellman's hangar, the little buildings scattered about, surrounded by ugly, sharp-cornered, gray boulders—a scene of desolation and gloom.

On the partially-wrecked landing-stage were heaps of gasolene-tanks and all kinds of articles left by Wellman. The Germans could see from it parts of the airship lying on the glacier—the gondola and a few sledges, some of the store of provisions and portions of the engines out in the open air. They went up to the hangar, the floor of which was still intact. In the workshops were carpenters' benches and tools lying about in wild confusion, chests and tinned goods, the valve of the balloon, a collapsible boat and several others, ropes and oars, rowlocks and sails, wooden utensils, great casks full of nails, screws, and brass parts. Near the carpenter bench heaps of shavings and chips; in the blacksmith's shop everything just as if it had been left the day before. Near the hydrogen house were quantities of iron filings and sulfuric acid containers, washing apparatus, and pipings.

Still more extraordinary was the spectacle inside Wellman's house. It consisted of a big inner room surrounded by a wide corridor. In the bathroom with its tub were all kinds of wardrobe, boots and toilet articles. In the kitchen attached was the kerosene stove with all sorts of dishes, plates, the drawers full of cereals, matches, toothpicks, canned goods. The dried remains of a soup stuck to the bottom of a sauce pan, and near it lay a new silver ladle; the kerosene can was nearby as if it had just been used for filling the stove. The photographing room was cluttered with bottles and measuring cups, basins and kodak films, chemicals of all kinds, everything ready for use even to the red dark-room lamp and the zinc pans; on the floor were the leaves of the book of directions

furnished by the kodak company. On bookshelves was a little library partly of technical works and partly of works of such literature as sea-faring folk buy for a song at every port. The bedsteads were provided with their covers; one was opened and disordered as if it had been occupied only an hour before. It was incomprehensible what had caused Wellman to abandon all these valuables without any attempt at putting them into order.

Things were quite different in Andrée's house, although there were many objects used in the preparations for the air-journey; everything was far more simply ordered; the beds like bunks; the walls hung with gray paper on which many persons had scribbled their names or messages.

Professor Hergesell's Animadversions. Professor Hergesell's account of the condition of the costly equipment is full of inaccuracies and unjust animadversions. He says:—

"On the open ground between the aërodrome and the dwelling house lay the wreck of the nacelle, the twisted propeller, the gasolene tank, strips of the cover of the balloon—all in wild confusion—showing how hastily the place was deserted after the catastrophe had occurred.

"Wellman, as we know, with the airship practically the work of a French engineer, had planned to make his start from Virgo Bay and to win to the Pole. He had neither made any tests with his balloon nor experimented to determine whether it would stand the voyage or mind its helm before he undertook flying great distances. His idea was that all this should be tried out on the spot. Under these circumstances it was not surprising that experts predicted disaster to the whole expedition.

"And so the undertaking resulted exactly as his preparations prognosticated. His plan, absolutely impracticable, in my opinion, of attempting to sail with an airship dragging a hawser, was the conditioning cause of the disaster. Anyone who has a practical comprehension of the conditions under which a dirigible balloon sails, must agree that this plan, applicable as it is in controlling the motion of a floating balloon,

is directly opposed to the nature of a dirigible. An airship which is in any way directly connected with the earth can not fly and is certainly not guidable. Wellman's ascent was a perfect proof of this. The airship went down by reason of the hawser as soon as it reached the polar ice and the very thing shortly happened that might have been foreseen: one of the heavy hawsers was torn off; the other fastened the balloon to the polar ice before it had sailed many kilometers over it. The vessel of Rittmeister Isachsen's expedition which happened to be in the vicinity noticed the dangerous position of the airship and succeeded in rescuing it from the polar ice and taking it in tow with his steamship. It was brought back by the Norwegian Captain and not by its own motive power, to its point of departure, Virgo Bay, where it suffered considerable damage. When they were going to empty the gas, the hydrogen caught fire and there was an explosion.

"Wellman, who realized that he could never make successful journeys with such a balloon, deserted Virgo Bay in all haste, leaving everything in confusion as we have described it. His attempt in his own country to raise funds to make a new and better balloon failed; he therefore gave up his plans for reaching the North Pole and devoted himself to carrying out a plan just as hopeless—of crossing the Atlantic from America to Europe. It is a matter of record that Wellman in this enterprise acted on the same fallacious principles. An untested ship should attempt such a gigantic task only when experts had declared that it was feasible after an enormous development of travel in the air."

As Wellman used the *America,* the same airship as he had at Spitsbergen, for his attempt to cross the Atlantic and which was abandoned off Cape Hatteras, the Germans could not possibly have seen the wreck of it at Houcker Bay, or, as they call it, Virgo Bay. What they probably saw was the remains of a small French airship which Wellman first took to Danes Island, and abandoned when it was wrecked before 1907.

The engineer to whom Dr. Hergesell referred was not French but American and he had perfect faith in the possi-

bility of reaching the Pole with the airship, as he had fully tested it. Wellman's own account is to the effect that the gales which prevailed all summer did not give them opportunity to try the ship until September 6. Then it was run out of the hangar. A steamer was directed out into the open ocean and kept pointing exactly north. The airship was placed over the ship and the compass adjusted. Then the airship was to turn around and come over the steamer with its bow pointing south and adjust the compass in that position. Before this could be done a snowstorm enveloped the airship with a squall from the northwest. The airship was nearly wrecked on the side of a mountain, but managed to escape. After a time they saw a glacier which they recognized as one about seven miles from their camp. The airship was let down upon this glacier and the string pulled which released the gas. In a few days they got the nacelle back to the camp and it was then too late in the season to make another attempt. Peary got to the Pole in 1909 and then Wellman announced that, as the Pole had been found, he would abandon his attempt.

Dr. Hergesell points out the fallacy of Andrée's attempt to reach the Pole by means of a drifting balloon, even when some dirigibility was effected by the dragging cable. He says: "Andrée, as we know, proposed to take advantage of the air currents to reach the North Pole with a drifting balloon. He also intended to cover considerable distances dragging the balloon by a cable, hoping on the one hand to give a certain dirigibility to it, and on the other materially to increase its durability for the journey. What in Wellman's case was directly opposed to the principles of such travel, was here a sensible and masterly provision. Nevertheless Andrée's undertaking, though it was in a certain sense well-considered, carried the germ of disaster with it.

"Andrée had made a series of preliminary balloon-ascents in order to test out the method of traveling with the dragging cable; but it must have been known that at that time at least a long journey through the air in a balloon could not be made, for ordinary balloons were not constructed to remain in the

air longer than a few hours, ten or twelve. Nevertheless Andrée was firmly resolved to carry out his experiment, because he was convinced that his balloon, constructed with the greatest care in the line of his experiments, would answer his expectations.

"He was so completely convinced that his plan would succeed that in the spring of 1897 he wrote me—I was then president of the International Commission for Scientific Balloon Navigation—asking me to postpone the session of the Commission until the following year because, as I knew, he was then engaged in preparing his North Pole Expedition and should be on the way in the summer and autumn; he would therefore be unable to participate in it but should surely be back the next year. Then it would give him great pleasure to be present at our meetings. Unfortunately this firm conviction of Andrée's was not justified by its result. As we know his balloon disappeared after its ascent. In all probability the bodies of Andrée and his two companions lie buried in the depths of the Arctic Ocean covered by sheets of everlasting ice. His Swedish compatriots have erected a simple memorial near the house that he occupied. A little obelisk bears on a simple plaque the inscription:

HÄR UPSTEGO
18 11/7 97
MED SVENSKA BALLONEN
ÖRNEN
FÖR AT SÖKA NORDPOLEN
A. ANDRÉE
N. STRINDBERG
R. FRAENKEL

"We stood a long time silently before this monument and thought of the gallant men who in this perhaps too adventurous a journey had found 'White Death.'"

A Harbor for the Zeppelin. The *Mainz* could hardly have found room on its long hurricane deck for a monster airship such as Count Zeppelin had devised and construed

A WHALING GUN-BOAT

WELLMAN'S CAMP, FROM DANE'S GAT

at enormous expense through the contributions of the German people. Explorations were made in Red Bay with the hope of determining a suitable base for a Zeppelin expedition to the Pole. This was found, and named Zeppelinhafen. Alas! the mighty monsters intended for peaceful and beneficent purposes were, within a few years after reaching the point of perfection, converted into terrible engines of destruction, carrying terror and horror to the innocent inhabitants of a once friendly country, and entailing death and insanity to the heroic air mariners who might have enlisted in a better cause.

View From a Captive Balloon. A great collapsible balloon and inflating apparatus were taken by the Zeppelin Expedition. It was transferred to the *Phoenix* and when that little vessel reached the northern ice-pack, was inflated and attached to a long, strong cable anchored by an ingenious and thoroughly tested ice-kedge. Professor Hergesell had charge of the difficult operations, giving his directions from the swaying basket, as Prince Heinrich jestingly expressed it, "like a preacher in the wilderness." Count Zeppelin was the only other passenger in the first accent.

"Slowly," says Professor Hergesell, "rose the balloon over the glittering plain of ice and before long below us spread out a remarkable view. The ship grew smaller and smaller, the men swarming about it were diminished to the size of ants and then the monotonous plain crossed by dark canals was all that impressed the beholder; endlessly the ice-desert stretched out toward the north and the northwest. Open water appeared to lie in the northwest but in the northeast there was nothing but ice, ice, which about in the region of Wijde Bay abutted against the mainland of Spitsbergen.

"It was a beautiful, but at the same time a dismal and disconsolate, sight. The inexorability and hardness of Nature exerted its full force on the mind in the midst of this icy death. Above us the sky looked white and dull even while the Midnight Sun inexorably gazed down as if with utter scorn on man's fragile construction that was lifting us up to behold this strange spectacle.

"In the mean time the weather had somewhat changed. At the elevation to which we had attained, blew a rather sharp wind which seized the balloon fiercely and shook the basket violently back and forth. We flew up and down in long oscillations. The cable rubbed against the basket in a disagreeable manner, and broke it suddenly in several places. Will the ice anchor hold? Will the easily broken rope also hold? These questions arose now and again in our minds as we flew erratically back and forth. When we tugged at the rope, we were flying directly toward the north: we had the very south wind so long desired by Andrée. How must this man and his companions have felt when they, not held firmly by the strong balloon-cable as we were, flew off over this comfortless waste of ice in swift flight in a craft which was in no way in their control but was driven untrammeled now hither now yon, the sport of the winds!"

Observations From the Upper Air. Hergesell made a few photographs—one of them reproduced and showing Zeppelin Bay with its island breakwater—and then as he was putting in another film his apparatus met with an accident. When they were laboriously hauled down Prince Heinrich took his turn in making the ascent but the wind had so increased that, though the whole length of the cable was paid out, no greater altitude than before was attained. Hergesell made some valuable observations, especially regarding the ice, which was geographied, as the French say, by many canals, and presented an array of crushed humps and hillocks eminently adapted for anchoring airships. There were also on the ice many fresh water ponds which, from above, were jet black, while directly below them gleamed a lake of the deepest blue. They could see many holes which seals used for breathing places. Ice conditions that year were particularly unfavorable and the drift-ice reached as far as the eye could see toward the west, while toward the east it reached the main island at Gray Hook. In the south rose the pointed peaks of North Spitsbergen; they could clearly make out Danes Island, Vogelsang, and the mountains of Red Bay, from which it was hoped

that in the further development of the dirigible "the monstrous white form of the Zeppelin would some day make its triumphant journey to the Pole."

Variations in Temperature. A large number of experiments were made with exploring balloons, provided with instruments for automatically registering temperatures, air-pressure, altitude and humidity, and other scientific facts. Their first trial balloon proved that at a height of eight thousand meters the wind was from the south. For these experiments they used a wire four-tenths of a millimeter in thickness. By means of the register they could tell the depth of such fog as might envelop them or the influence on the thermometer of clouds high up. As a general rule the temperature falls six-tenths of a degree Centigrade for every hundred meters. The rubber balloons a meter and a half in diameter ascend with great rapidity, often to a height of fifteen thousand meters, though in individual cases they have registered more than twenty-nine kilometers.

It had been generally supposed that the regular fall of temperature would ultimately, in the uppermost strata of the earth's atmosphere, reach absolute zero—273° below zero Centigrade. But the discovery had been recently made that at an average height of eleven kilometers the temperature, instead of continuing to grow colder, remains practically constant. This had been proved to be true in the vicinity of Strassburg where the atmosphere was tested to a height of twenty-nine kilometers; it was the same over the Mediterranean and over the equator. Professor Hergesell's experimental balloons sent up from Spitsbergen attained a height of thirteen thousand meters, and registered the isothermal of the constant temperature as beginning at about ten thousand: this was about 60° below zero Centigrade, which at a height of twelve thousand had decreased to minus fifty-four.

A Study of Spitsbergen Weather. The cause of this alteration is attributable to the effect of the sun and the rising of currents of warmer air during the long summer days. Many observations were also made regarding wind directions

and velocities. On July 16, 1910, for instance in Green Harbor a light west-north-west wind was blowing up to a height of about two hundred meters; then it changed to a northeasterly wind which affected the air to a height of ten thousand meters. These experiments were important in explaining how it happens that in adjoining harbors in Spitsbergen very different weather conditions may obtain. The effect of the sun on the strata of the atmosphere just above the sea may cause a wind in one direction, while the heavy air blowing down from a glacier-filled valley may develop into a gale. This has been noticed by many visitors at Spitsbergen. A wind blowing in gusts of forty miles and more an hour will be confined to a height of less than a thousand feet, while above that it may be a dead calm.

In the same way one bay may be filled with fog, so that nothing can be seen a ship's length away and the tops of the neighboring mountains are entirely hidden, while in another, separated from it by only "a camel's back" the sun will be brightly shining. The weather is evidently more or less conditioned by the geological conformations, which in one place conduce to absorption of the sun's rays and tend rapidly to melt the snow and ice, while in an adjoining valley there are glaciers and névés.

All these varying conditions, so manifested within a comparatively small area, make Spitsbergen particularly attractive to the scientist. It is a kind of working laboratory where Nature can be seen performing her wonders not dragged out through millenniums but, as by cross-sections, all going on at the same time and available for comparison.

IX. THE SPITSBERGEN QUESTION

1. VARIOUS OPINIONS

THE DIFFERENT aspects of Spitsbergen, so dissimilar often in close juxtaposition and so apparently accidental, account for the contradictory reports of both earlier and later visitors. One speaks of the prevalent clearness of the atmosphere; another complains bitterly of the almost constant fogs; one reports abundant vegetation and lovely flowers growing in brilliant hues; another chronicles only a melancholy waste.

SCORESBY'S ENTHUSIASM. Scoresby thought the scenery altogether novel, and after a somewhat detailed description of the glaciers and the mountains perpetually covered with a mourning veil of black lichens contrasting with robes of purest white, and all "enlightened by the occasional brilliancy of the Polar sky and harmonized in its serenity with the calmness of the ocean, constituting a picture both novel and magnificent," he adds:

"There is indeed a kind of majesty not to be conveyed in words in these accumulations of snow and ice in the valleys and in the rocks above rocks and peaks above peaks rising above the ordinary elevation of the clouds and terminating occasionally in crests of everlasting snow, especially when you approach the shore under shelter of the impenetrable density of a summer fog in which case the fog sometimes disperses like the drawing of a curtain, when the strong contrasts of light and shade, heightened by a cloudless atmosphere and powerful sun, bursts on the senses in a brilliant exhibition, resembling the production of magic." But on the whole he confesses that the climate of Spitsbergen "is no doubt more disagreeable, to human feelings, than that of any other country yet discovered."

Phillips-Wolley's Disillusion. Clive Phillips-Wolley, in his "Trottings of a Tenderfoot," published in London in 1884, devotes about a hundred pages to what he called "the Spitsbergen swindle." He went up on the *Pallas* and landed at Green Harbor toward the end of July. He was impressed by the flowers and the birds, but not by the landscape: "Anything more desolate and barren than the islands in Bell Sound can not by any chance exist on earth. The surface of them, for the most part, is bare dark rock belonging to the carboniferous class, the strata upturned in such a way as to render walking difficult and painful. The rocks are full of fossils, as well as a few nodules of iron-stone."

Illusory Gold. Of coal and iron he saw traces while in Spitsbergen but the wonderful golden sand which the Danish captain found in the seventeenth century escaped his notice, as it has everyone else's since the analyst of Copenhagen discovered that the little bottleful of sand in the museum really did contain a considerable quantity of pure gold. It is strange if the two stories, that of the Copenhagen golden sand and the gold in the pebbles brought home by Martin Frobisher's seaman be true, that nothing more has been heard of Spitsbergen as a gold-field since the seventeenth century!

"The Tenderfoot" and his party of twenty men and seven ladies went up as far as Danes Island and Vogelsang in latitude 79° 55′. But he wanted no more of Spitsbergen.

Mrs. Holmes's Hunting Trip. In 1906 Mrs. Bettie Fleischmann Holmes, of Cincinnati, caused to be privately printed in a sumptuous volume illustrated from photographs, an account of a hunting trip. It was entitled "The Log of the *Laura*." The yacht visited Spitsbergen and she made notes of the birds and other wild life. She thought that even though the slopes and valleys were covered with slush and mossy bogs, and everywhere the eye rested on barrenness and desolation, yet "withal there is a wonderful beauty in the frozen grandeur of the far Northland which inspires an inexpressible feeling, a deep mysterious awe."

Professor Miethe, as a scientist and not a mere huntsman,

NORTH CAPE

ENTRANCE TO ICE FJORD, NORTH SIDE

looked on the Spitsbergen landscapes with a keen interest in their geological and geogonical aspects. Yet he has a great deal to say about their picturesqueness. He thus describes the first approach to Ice Fjord and its entrance:—

"Prince Charles Foreland, a narrow island stretching north and south opposite West Spitsbergen is traversed by a striking chain of Alpine mountains, the everywhere steep and characteristic peaks of which are clearly visible in the blue haze of the distance. Nearer to us lies the flat, saddle-like South Cape of the island, over which a delicate violet fog-bank hovers lonely against the blue sky. But before us to the east towers the lofty mountain-chain at the entrance of the Ice Fjord. The broad mouth of this, the largest of all the Spitsbergen sounds, is bordered on the left, that is to say, on the north by a high range of mountains completely covered with glaciers, with the crest of Dødman as its center, from the sides of which wide glacier-faces push down into the sea at the west and toward the north coast of the Ice Fjord. This highest peak is surrounded by a varied chain of steep mountains generally free of snow and stretching inland while between them are level plateaus covered with perpetual snow which feeds the great glaciers.

"The south side of the entrance, on the contrary, Cape Starashchin, has a smaller elevation composed of more rounded formations and is for the most part covered with flat snow-fields. We have here for the first time an example of the very ancient primitive rock-strata the so-called Hecla Hook with its steep precipies torn and worn, strikingly like the Central Alps, and of the later deposits of the Mesozoic and Tertiary Ages, which indeed, here and there form sharp peaks, but for the most part, because of their situation, and also because of the unusually complete weathering, present forms of a softer and more plateau-like character. Consequently the shores and elevations on the south side of the Ice Fjord far into Sassen Bay are in their general mountain-character more softly-outlined, more rounded and also lower than those on the north side with its notched gneiss and mica-slate mountains.

"Equally striking as the difference in shapes is the difference in the glaciation. The deep taluses which cover the later formations and enwrap them in a thick mantle of loose boulders, appear to be, in their instability, unfavorable for the formation of glaciers. Neither in Green Harbor nor in Advent Bay are there to be found any extensive glaciers, while the whole north coast of the Ice Fjord is constituted of an almost unbroken succession of flat glacier-tongues pushing down into the sea, with black, tooth-like mountain-peaks rising above them."

Scenery at Green Harbor. Professor Miethe could not see why Green Harbor got its name. Scarcely a trace of vegetation was visible. The mountains were gray and bald; only here and there were detestable-looking swamps where the land was level and melting snow allowed a little moss, and delicate Alpine flowers fought for existence. Everywhere the tones of the landscape were gray and brown shading in the distance into violet. "The view was monotonous and melancholy, but the marvelous sun, spreading its splendor over the snow and ice, over the calm waters and the level coast-line, filled the scene with a certain magic of peaceful rest and Arctic grandeur, which was deeply impressive. It seemed as if the orb of day were taking especial pains during the brief summer season to flood even this desolate corner of the earth with beauty, with a fulness of color and glory, as if it were aware that all too soon it would take its departure from this inhospitable shore and leave it to the fogs and storms of winter."

Advent Bay as a Tourists' Goal. Advent Bay was to Professor Doctor Miethe a bitter disappointment—*eine grimmige Enttäuschung:* "Surrounded by monotonous, low, partially snow-covered gray heights, stretching away without picturesque charm, and separated by dull valleys running inland, the bay," he says, "stretches out to the south toward an insignificant background of mountains without anywhere presenting a notable form or a sharp peak; only here and there flat ridges and valley-openings with tiny glaciers gray-green in

color, clay and rubble along the barren shore; but at the right appeared a more pronounced valley, at the entrance of which stands the dock of well-known mining-works of the Arctic Coal Company, the mountain-side buried deep in an enormous talus of sand and stone with nowhere an outstanding crag, with nothing but piles of rubbish and débris."

He thought it very strange that Advent Bay should have been for so many years the objective point of tourist ships, since it is "of all the western harbors the most uninteresting and the least characteristic; and its reputation of being ice-free is wholly undeserved."

The great ship *Mainz,* on which the Zeppelin Expedition visited Spitsbergen, was for several days—just after the middle of July, 1910, ice-beleaguered in the harbor. Some of the scientists utilized the enforced delay by going ashore and making inland trips for the purpose of exploring Advent Valley but found the swampy flats most difficult and exasperating. Others of the party managed to reach the dock under the skilful direction of Prince Heinrich and visited the mine. Dr. Miethe says:—

Dr. Miethe's Description of Longyear City. "This coal-mine is so far the only one in Spitsbergen that has succeeded in producing a really practicable coal; it is of comparatively recent origin but is of fine quality. The English (!) company which works it during the summer months, transporting the product by its own special steamer, has in a model way organized the entire management of this noteworthy mine. In the desolate valley on the northern declivity of which is the gallery leading into the interior of the mountain, has arisen a small 'city' of wooden houses which provide pleasant and healthful quarters for the workmen; in other respects also their welfare is wisely looked after. Liquor is obtainable only by means of the tourist steamers coming to Advent Bay.

"The environs of this little settlement, called 'Longyear City,' are anything but picturesque. Situated on the dun, beaten, and dusty tundra, close by the stony declivity of the mountain, it looks out across the southern part of the bay and

the desolate Advent Valley on the one side, and on the other to the stern, melancholy, snow-covered head of the valley.

"The mine is connected by an aërial tramway with a landing at the Fjord, and the mining itself, in the hard-frozen, horizontal strata, appears very simple. It seems as if this enterprise might be capable of yielding a continuous if modest profit, as long, at any rate, as the Norwegian Government favors the Advent Bay coal for the use of the railroad from Narvik down to Sweden."

2. SPITSBERGEN AS A SUMMER RESORT

The first experiment in carrying tourists to Spitsbergen was made in 1871 by a German naval officer, Captain Wilhelm Bade of Weimar, who had been a member of the 1869 Expedition to East Greenland. After a lapse of twenty years he began again and had considerable success, taking up not only sightseers but also scientists. In 1893 the Hamburg-American Line sent up the *Columbia* making Advent Bay its objective; the *Lusitania* was sent up the following year by the Orient Company; and from that time several ships each season were engaged in the tourist traffic, and carried some seasons as many as two thousand passengers. Some of the ships sailed far enough to the north to give a glimpse of the Polar ice-belt and to witness what is called the "ice blink."

The Ice Blink. The ice blink is described as a rather brilliant light stretching along the horizon. A trained Spitsbergen pilot is able to judge of the character of the ice-floe which causes the reflection, even when it is thirty nautical miles distant. Pack-ice has a characteristic yellow tint. Pack-ice is almost pure white; bay ice is grayish. When the rays are reflected from snow-covered land it is still more yellowish in tone.

Almost all floating ice is likely to be accompanied by fogs; but when the ice is firmly attached to the land the atmosphere is free from them. Out of three hundred and eighteen days Captain Tobiesen, who made three observations a day during the year, found clear weather only one hundred and twenty-

seven times. Many seasons it is undoubtedly still worse. The temperature as observed in various months in 1865 and 1866 ranged from 7.1° above zero Centigrade to 28.4° below, with an average for eleven months (July being omitted) of 5° below zero. For July, 1899, the average was 2.7° below.

The Tourist Hotel at Advent Point. In 1896 the Vesteraalen Steamship Company built on Advent Point a hotel, or *Turist-hütte,* large enough to accommodate twenty-five guests. Here during the next summer the Spitsbergen "Gazette" was published, and a set of appropriately-designed stamps, valueless for postage but interesting as souvenirs were kept on sale and are now much-prized rarities for collectors. The hotel was maintained for only two years. Hauptmann J. Roth, Dr. A. Bergen and O. Graf Zedlits who published in 1902 an account of a hunting expedition under the Midnight Sun in a chapter entitled "Advent Bai," tell how they had the keys to this one-story building but preferred to stay on board the ship rather than set up housekeeping in it. Nor could they find a single fragment of coal.

Jules Leclerq, who visited Advent Bay in the Finnish cruiser *Oinonna* in 1904, describes the little hostelry as a sort of log-house *couleur sang de bœuf percé de dix petites fenêtres.* After remaining vacant for a number of seasons it came into possession of the Arctic Coal Company and was used as a storehouse. Just before the war, the North-German Lloyd Company selected a site for a new and larger hotel on the shore of Cross Bay. Sometime, doubtless such an enterprise will succeed; visitors really need more time than the ten days allowed by the ordinary cruise, to get a fair impression of Spitsbergen. One should at least await the clear skies that occasionally alternate with foggy and cheerless conditions. Then the mountains clothe themselves in lovely delicate diaphanous veils of violet light; the sharp peaks pierce the infinite blue; far distant ranges seem almost within reach; the colors of the glacier-ice and of the floating masses are beyond the power of language to describe. One such day off the coast where the Seven Glaciers break through the cliffs; or on a mountain top with a view

extending over fjord and sea and into the complicated network and maze of valleys and mountains inland, will atone for a week of cold, fog and rain.

Summer Climate. Thunderstorms never sweep over the island; the climate varies so much from summer to summer and from harbor to harbor (one might say), that it is hard to generalize about weather conditions. Conway declares that the air of Spitsbergen is not stimulating but resembles that of a moist English spring when the ground is clammy beneath a dripping sky. Scoresby wrote, "The climate of Spitsbergen and the adjoining sea, is, in the autumn and spring seasons, variable and tempestuous. The temperature passes through its extreme range which probably exceeds 50° in the entire season or even in the same month with a rapidity unknown in countries situated within the Temperate Zones. Northwest winds bring with them the extreme cold of the icy regions immediately surrounding the Pole, whilst a shift of the wind to the southwest, south, or southeast elevates the temperature toward that of the neighboring seas."

Many visitors speak of finding their ordinary northern clothing too warm when basking in the sun but on the other hand the sudden arrival of a fog or of a storm bringing a considerable snow-fall, may cause suffering to one not thoroughly prepared.

Travelers across the snows or up the valleys are frequently exposed to immersion in icy water, but such exposure, even though no opportunity may offer for several days of affecting a change to dry garments, never causes colds. Mosquitoes, which are such a pest in Alaska, are rarely mentioned by travelers. They occur however when hatched out in the stagnant waters of the tundra. Decay is scarcely ever observed either in the coffins of the ancient whalers buried among the rocks, or in the wood of trees cast up on the shores by the ice or the swirling currents. The peril of navigation in those northern waters is no greater than elsewhere. Comparatively few ships have been wrecked there within recent years and among the tens of thousands of tourists and miners and fisher-

men who have gone up either in private yachts or in great steamers or on colliers few lives have been lost. Undoubtedly Spitsbergen will be in time-to-come one of the great pleasure and health resorts of the world: for it will offer a wonderful opportunity to make acquaintance with the Polar regions with a minimum of discomfort and of danger. One may easily conceive that one of the future attractions will be a day's excursion on a luxuriously appointed Zeppelin air-ship to the North Pole and back. Ten or twelve hours would suffice for the trip with time for a picnic on that no longer mysterious *Pamir*. It may be as much a part of the Spitsbergen lure as the North Cape was formerly to those that visited Norway.

The Ownership of Spitsbergen. The question of the ownership of Spitsbergen was finally settled by the Congress at Versailles. It was apportioned to Norway without a protest from any of the Governments which had for so many decades objected to any national control. It is therefore unnecessary here to go into the history of the conflicts and negotiations regarding its status. M. Leclerq, after speaking of the climatic changes which had produced in turn first an exuberant tropical vegetation, then a flora analagous to that of temperate regions with ferns, beeches, cypresses, sequoias and the like, impressing their forms in *caractères saisissants* on the rocks to be preserved through the ages—a genuine fossil herbarium (to use Nordenskjöld's vivid expression)—mentioned the existence of coal-beds on the western island, and he expressed the apprehension that this might excite the competition of what he calls the "Colonial Powers," should the products not prove to be of too mediocre a quality and the beds not have too meager a thickness (*trop mince épaisseur*) for exploitation. He thought it would be embarrassing to decide to which part of the world Spitsbergen belonged, for though it seemed separated from Norway by only a deep depression, he doubted if it belonged to Europe and therefore suggested for the archipelago the name—Nordalia.

A few scientific men in England and Scotland exerted themselves by means of letters, pamphlets, lectures, and books,

to arouse a popular interest in the Spitsbergen Question, but neither the people nor the Government responded with any heartiness. In January, 1917, Douglas W. Freshfield, President of the Royal Geographical Society, in behalf of the council of that learned body, addressed a letter to Mr. Balfour, Secretary of State for Foreign Affairs, giving a résumé of the arguments in favor of Britain's right to Spitsbergen. After stating that no other countries had anything beyond commercial properties and temporary occupation, it said:—

The Royal Geographical Society's Appeal. "The first and most essential geographical factor in the situation is that a large group of islands, permanently inhabitable and accessible to vessels during four or five months in the year (probably with ice-breakers, during the whole year); islands containing large and valuable deposits of coal, almost equal in quality to the best Welsh steam-coal, and situated only some sixty to seventy-two hours' steam from Scottish ports, are under no jurisdiction whatever. Spitsbergen is a *terra nullius;* property acquired by occupation is at the mercy of the strongest newcomer; might is right; there is no security against, or redress for, wrong-doing. Disputes and contests have consequently arisen from time to time between the miners and trappers, English, American, Norwegian, Swedish and Russian, who claim rights in the island.

"The Council through the president, therefore, urged that the only satisfactory way of meeting the situation was for His Majesty's Government, in agreement with the Allies, to take proper steps to settle the future of Spitsbergen as they might deem expedient, either by proclaiming the sovereignty of Great Britain over the islands or over that part of them to which since its annexation in the seventeenth century they held as an historical claim superior to that of any other nation."

Mr. Freshfield also pointed out that strategically it was very important for Great Britain to control the islands, since in case of future wars, it might serve as "a convenient base for submarine activity on a trade-route that was bound to grow in importance."

Mr. Balfour waited until March, 1917, before replying, and then in a very formal letter stated that the question regarding the status of Spitsbergen could not be decided without discussion with several foreign governments and that it was not the time for such matters to be discussed or decided.

Dispossession of Germans. Nevertheless in September of the following year the newspapers announced that a naval expedition under the command of Sir Ernest Shackelton had gone up to Spitsbergen and taken possession of the German iron and coal mines at Cross Bay, seizing the wireless installation, the mining equipment, and supplies sufficient to last three years, and capturing a large number of miners and proclaiming the annexation of the archipelago. The statement was exaggerated; there was not a German miner at the station, and the operators of the wireless had escaped to Germany three years before. The only annexation was that of an English Company which took possession of a German mine, just as the Norwegians made the war a pretext for jumping many of the English claims. Dr. Rudmose Brown develops considerable heat toward the end of his book on Spitsbergen in recounting the piratical acts of the modern Vikings.

Anker's Plea for Norway. The report of this move on the part of England caused considerable excitement in both Norway and Sweden, and the Scandinavian journals published many editorials mainly in protest. The arguments in favor of Norway were well summed up in a letter written on September 4, 1918, by Ella Anker, London correspondent of the Kristiania daily, "Dagbladet" and published in the "Manchester Guardian." He first gave his historical reasons showing that Norway (in the language of the famous French geographer, M. Charles Rabot) had possessed the sovereignty of Spitsbergen since the thirteenth century, and had never relinquished it. In the course of his article he says:

"The discovery of coal and iron at Spitsbergen in the last decades has again raised the old question, and it has now become urgent to establish a legal administration for maintaining

law and order. The Norwegians were the first in modern times to exploit the natural wealth of Spitsbergen, and started coal mining in 1899; the English and Americans came in 1905, the Swedish in 1911, and the Russians in 1912. The Norwegian plant is constructed for the production of two hundred thousand to three hundred thousand tons a year, and the Norwegians exported during the last year (1918) fifty-five thousand tons of coal; the Swedish only four thousand, the Russians twenty-five hundred, and the English had no export. During the last winter the population was eight hundred and twenty workers, of whom five hundred and eighty were Norwegians belonging to the Norwegian settlement, one hundred and twenty to the Swedish, fifty to the English and seventy to the Russian."

Norwegian Achievement. He went on to show wherein the Norwegians were best fitted by nature and experience to control the islands: "The Norwegians have constructed boats able to pass across the floating ice. They are on the whole nearest by nature and geography to take care of these islands where they have been fishing and hunting for centuries, and know the fjords almost as well as they know their own fjords. Norway has taken a prominent part, too, in the scientific exploration of the land, as of the Polar regions both in the north and in the south. One of the scientific pioneers was Professor Keilhau in 1827. The first who circumnavigated Spitsbergen was the Norwegian seaman, Captain Elling Carlsen in 1863. The Norwegian Government equipped in 1912 a scientific expedition which has already mapped out twelve thousand square kilometers and made important geological investigations, and this work is being continued. The Norwegian Government has organized post and telegraph services for Spitsbergen and worked there at its own cost for a long series of years."

The Controversy Settled. All this newspaper controversy was quieted by the action of the Peace Conference, which coupled with its assignment of Spitsbergen to Norway the stipulations that all nations should be "allowed to trade

there subject to the laws and regulations of Norway," and that it must never be used for military purposes.

This was probably the most natural and logical solution of the vexed question. It satisfied the Norwegians who had been eager for its acquisition. That it has been accepted by the English is shown by the tenor of the following extract from a recent trade supplement to the London "Times" which, after speaking of the steam-coal, estimated to amount to more than two hundred million tons, and an even greater supply of "household coal," went on to recount the other sources of wealth on Spitsbergen. It said:

Natural Gas and Petroleum. "There are muddy pools on the islands, where gas bubbles up through the mud, and last year an analysis of the gas showed that it contains a large percentage of petroleum. A new and hitherto unsuspected source of fuel had probably been revealed by those bubbles of gas, and now arrangements are being pushed to prospect the region thoroughly with a likely result of finding a new oil-bearing region. Spitsbergen is richer than was generally imagined a decade ago: during the last few years iron, copper, lead, gypsum, asbestos and other minerals, as well as promising hints of gold and silver, have been discovered, and large beds of colored marble have been opened.

"All of this is interesting to the world at large, and particularly interesting to the British who have acquired ownership of about three-quarters of the mineral area. Norwegians, Swedes, Dutch, and Germans are also busy developing this island wealth, over which, by the decision of the League of Nations, waves the sovereign flag of Norway."

The Purpose of the Boon. By the transfer of the coal properties of the Arctic Coal Company from American control into the possession of a Norwegian syndicate, the greatest industry on the island became Norwegian. The present work is devoted to a rather thorough-going account of the inception and development of the mine at Advent Bay. It will be seen how much foresight and energy were put into the demonstration of its practicability, despite the inherent difficulties of

its situation, and the handicaps imposed on its promoters by the stupid and narrow-minded jealousies of some of the Norwegian authorities. It is a most inspiring story of American efficiency.

Part Two

THE ROMANCE OF AN ARCTIC COAL-MINE

THERE is, as every schoolboy knows in this scientific age, a very close chemical relation between coal and diamonds. It is the reason, I believe, why some people allude to coal as "black diamonds." Both these commodities represent wealth; but coal is a much less portable form of property. There is, from that point of view, a deplorable lack of concentration in coal. Now, if a coal mine could be put into one's waistcoat pocket—but it can't. At the same time, there is a fascination in coal, the supreme commodity of the age in which we are camped like bewildered travelers in a garish, unrestful hotel.

JOSEPH CONRAD

I. THE STORED TREASURES OF NATURE

1. PREHISTORIC HISTORY

IT is possible to imagine that when this world was created, all its elements might have been so disposed as to form concentric casings or envelopes, with platinum at the center and this surrounded by a sheath of gold, and so outward in the order of their specific gravity. The mighty energies liberated by the cooling of the commingled gases produced, and still occasionally produce, in the resulting fluids and solids, cosmic changes often of indescribable violence. Vast territories are overturned, and what was below comes to the top. Lofty mountains are upheaved; islands emerge from the depths of oceans; continents are submerged. During the geological eras complete transformations have taken place in the face of the earth. Millions of human beings live on what was once the bottom of boundless waters; rivers rushing down from snow-clad ranges spread over great plains and gradually build up fertile prairies. Even now when Mother Earth seems in many places in a static state there is no such thing as complete quiescence. Erosion, frost, even the action of the winds, all the vibrations of light and electricity conspire together to diminish the heights of the hills and to fill up the valleys, especially the valleys which are the beds of lakes and seas.

Volcanic Action. There are earthquakes every day in some parts of the world; volcanoes which have been apparently long extinct, like Elbruz in the Caucasus, break forth with violence and cover all the surrounding country with ashes. There are regions which still partake of the rapidly-fluctuating conditions that must have obtained when the world was young. Many of these are in the Far North, as in the archipelagoes stretching to the west of Alaska, where the seven fiery mountains smoke all the time, where the energetic Bogoslof rises

high above the ice-covered water one year, and the next may cheat the expectant whaler by having sunken out of sight. Krakatoa in the southern hemisphere suddenly blows to pieces, with a report heard for a thousand miles, and involves in destruction a million hapless inhabitants. Mt. Pélée in a single night reduces to a wilderness a fertile island in the midst of the smiling Caribbean Sea. Mines of precious metals worked by generations of laborious men are hidden by such cataclysms and are forgotten for centuries, only to be rediscovered and opened up again.

Wisdom of Nature. It seems as if Nature intentionally disposed her riches so that no one century should exhaust them; put them at the extremities of travel so as to make them difficult of access; buried them under thousands of feet of solid rock; heaped glaciers and icebergs over them; so as to stimulate the energy and enterprise of man to get at them and treasure them, giving them cryptic clues which only those initiated in science or endowed with intuition are able to follow.

In Canada there is a place where copper pyrites crop out on the surface. A keen-eyed mining engineer notices the dip of the strata. He keeps his counsel, and after a careful computation proceeds to Charlemont, a sleepy farming village in western Massachusetts, where he buys for a trifle a thousand acres of grazing land. In midwinter he digs down a few feet, and there is the lode of copper pyrites ready to greet him as its master. Hitherto most of the sulfuric acid used in the United States had been brought from the volcanic hills of Spain. Henceforth this Massachusetts mine furnishes a greater supply at a cheaper price: the industry is revolutionized; the farming village becomes a new kind of center. The wealth of material was there for ages; but the Red Skins knew nothing about it and generations of hard-working farmers won a precarious existence only a few feet above inexhaustible riches.

When Prometheus taught mankind to warm themselves with fire he did not show them what to burn. If he had, perhaps "the Age of Steam" would have preceded Christianity.

Knowledge of Coal. As long as wood is abundant and therefore cheap, the greater convenience of procuring it made men slow to utilize the stores of anthracite or soft coal even when they were at hand. The Greeks and Romans knew that coal would burn; but if they ever mined it, the operations were probably confined to superficial gleanings, as in cases where it was found in lumps in the beds of streams or in pockets on hillsides.

The history of civilization might have been reversed had the peoples of ancient times added to their culture the knowledge of the use of coal. The Phoenicians, who made the long and dangerous voyage in small galleys from the Mediterranean to the coasts of Cornwall to procure tin, might presumably have also worked the great coal-deposits of Britain, had they been aware of its value as fuel. In that case, who can doubt that the immeasurable power furnished by the combustion of this concentrated fuel would have put them in the forefront of progress, or that the inventions in all mechanical and even chemical processes which have made the last century so marvellous would have been anticipated?

If this had happened, the coal of the whole world in the thousands of years since they and other cultured peoples of antiquity rose, flourished, and decayed, would have been largely exhausted long before our era and we might have been reduced to the level of the cave men.

2. FIRST USE OF COAL

It is not known when coal was first used for fires. Prehistoric races, of short stature and with abnormally large feet, perhaps akin to the red-headed Pygmies of northern Africa, and now existent only in the legends and imagination of old women, once mined coal in Ireland, and their shored-up excavations are still pointed out to the curious. Only within the past few centuries did their successors take the hint.

Coal in England. In England the surface outcrop of coal was considerable, and probably in localities where it was found the inhabitants in remote antiquity made use of it for

fires. As early as 852 A.D. records show that it was employed for domestic purposes. In the thirteenth century it was sold extensively in London, but only for manufacturing. As no pains were taken to control the gases arising from combustion complaints were made that it was injurious to health, and in 1316 Parliament petitioned King Edward II to prohibit its use. A proclamation was issued against it; but owing to the high cost of wood the edict was disobeyed, and it was largely burned in the City of London. The first Royal Charter giving the town of Newcastle-on-Tyne leave to dig coal was signed by King Henry III in 1239. During the next forty years considerable legislation on the subject of traffic in "sea-coal" had accumulated.

Possible Exhaustion of Coal Supply. After the invention of the steam engine, a little more than two hundred years ago, there was a rapid expansion of coal-mining. The tonnage increased by leaps and bounds, with a corresponding advance in price. In 1888 the annual consumption in Great Britain was reckoned to be one hundred and sixty million tons and experts estimated that the British mines, controlled by less than four thousand collieries, held in reserve only a little more than ninety billion tons—not enough to last sixty years. Fortunately other deposits have been discovered in all parts of the world, and while there is enormous demand for this condensed fuel, the day of its final exhaustion is still remote. But all civilized lands at the present time, knowing that their prosperity depends on a sufficient supply, since a ton of the best quality represents the day's labor of more than two thousand men—are constantly preoccupied with endeavors to increase the amount available, and prospectors seek to discover new sources even in far distant localities.

Early visitors to Spitsbergen noted float-coal in considerable abundance in the beds of the streams flowing down from the glaciers. The black or gray-black streaks evidencing the outcropping of the coal-strata on the mountain-sides must have also attracted attention, but it bore no practical fruit. When large and constant fires were required to boil the blubber of

whales and walruses taken in the waters thereabouts, it might be supposed that the proximity of this fuel would have been utilized. The first mention of blubber-boiling occurs in 1605, when the Muscovy Company sent Stephen Bennet to Cherry or, more properly, Bear Island to kill walrus. They obtained eleven tons of oil. The following year they killed between six and seven hundred walruses and made twenty-two tons of oil. No mention seems to have been made as to their fuel; but Mother Nature, by one of those ironies characteristic of her, saw fit to heap the shores of the archipelago with a vast amount of wood, called by the Germans *Noahholz,* which floated down the great Siberian rivers and were taken by the Arctic Current and carried to Spitsbergen, or were brought across the Atlantic by the Gulf Stream and pushed high up by the force of the ice on the shores of the islands. They undoubtedly burned the wood which was at hand.

Coal at Coles Bay. Ice Sound, which was discovered and named by Jonas Poole in 1610, has a number of inlets, one of which at the present time is frequently called Coal Bay, but the modern spelling, due perhaps to the fact that coal has been discovered there, is a mistake: it should be Coles Bay. It was called Coles Park by Edward Pelham, who with seven other men were "left by mischance in Greenland Anno 1630, nine moneths and twelve days." Pelham in his graphic narration tells of the care they took "for firing to dresse their meate withal and for keeping away the cold." They found "seven Shallops that had been left a-shoare there by the Ships, very crazie and not serviceable for the next yeare." He says: "Those wee made bold withall, brake them up and carried them into our house, stowing them over the beames in manner of a floore." They also "made bold to stave some emptie Caske that were there left the yeare before, to the quantitie of a hundred tunne at least" and some planks and two old Coolers and "whatsoever might well be spared, without damnifying of the voyage of the next yeare."

The narration shows how careful they were not to be reckless of their fuel:—

"Thus, having gotten together all the firing that wee could possibly make, except we would make spoile of the Shallops and Coolers that were there, which might easily have overthrowne the next yeares voyage, to the great hindrence of the Worshipfull Companie, whose servants wee being, wee were every way carefull of their profite. Comparing, therefore, the small quantitie of our wood, together with the coldnesse of the weather, and the length of time that there wee were likely to abide, we cast about to husband our stocke as thriftily as wee could, devising to trie a new conclusion. Our tryall was this: When wee rak't up our fire at night, with a good quantitie of ashes and of embers, wee put into the midd'st of it a piece of Elmen wood—where, after it had laine sixteene houres, wee at our opening of it found great store of fire upon it, whereupon wee made a common practice of it ever after. It never went out in eight months or thereabouts."

3. SPITSBERGEN FUEL

After the walrus had been almost annihilated and the whales had learned the wisdom of not repairing to the Spitsbergen bays, either because they found them growing too shallow or because they scented danger, the practice of cooking oil on the land was gradually discontinued; the large summer town of Smeerenburg fell into decay, and, before the middle of the seventeenth century, was abandoned. A sailor from the French town of Cibourre on the Bay of Biscay is said to have invented the process of boiling blubber on deck of the whaling-vessels and of using for fuel the whales' fritters—that is, the residuum from the first boiling. Since this was done at sea vessels had to carry their own fuel, and there seemed to be no reason for searching for any other than the drift-wood on the shores. Almost every visitor to Spitsbergen has mentioned the quantities of drift-wood piled on the beaches or the shingle.

Robert Fotherby, in his description of the Moscow Company's expedition in 1612 tells of going ashore in a "Biska shallop," or whale boat, and killing three bucks. He says:—

"Wee found them to be but pore rascles, yet verie good meate, as we presentlie made tryall and tasted. For, finding ther (as there is in all places of the countreye) great store of driftwood, which the sea bestowes on the barren land, and being also well provided of hunter's sauce, wee made a fier and broiled some of our venison, and did eat thereof with verie good appetites."

James Lamont, who cruised about in those waters in 1858 in his one hundred and forty-two ton yacht, *Ginevra,* tells of sending his boat's crew ashore to load up with driftwood, "quantities of which of excellent quality and in every stage of preservation," he says, "strewed the shores of the island." He noticed that much of this wood lay far above high-water mark, and in positions where it could not possibly have been driven by storms in the relative levels of land and sea at that time, and therefore came to the conclusion, which was fortified by other observations that "the whole of Spitsbergen has been gradually rising within the last few hundred years and that this upheaval, which he estimated to have amounted to twenty-eight feet in two centuries, had driven the whales away from the bays and fjords. This is, however, a moot-point. Many argue that no great change in elevation has occurred.

Lord Dufferin's Description. Lord Dufferin in his "Letters from High Latitudes" in describing his visit in the summer of 1856 to English Bay—a small bright tributary to Sir Thomas Smith Bay—or, more properly Cove Comfortless, says: —

"A little to the northward I observed—lying on the sea-shore—innumerable logs of driftwood. This wood is floated all the way from America by the Gulf Stream, and as I walked from one huge bole to another, I could not help wondering in what primeval forest each had grown, what chance had originally cast them on these waters, and piloted them to this desert shore. Mingled with this fringe of unhewn timber that lined the beach, lay waifs and strays of a more sinister kind, pieces of broken spars, an oar, a boat's flag-staff and a few shattered fragments of some long-lost vessel's planking."

4. COAL DISCOVERIES

Lord Dufferin's special object in visiting these regions in his schooner-yacht, *Foam,* was to examine some coal-beds which were said to be existent in the upper strata of the sandstone formation on Bear Island; but an impenetrable barrier of ice prevented him from getting within sight of it.

Repeated Mention of Coal. It seems remarkable that earlier attention was not attracted to the rich deposits of coal so clearly visible in Spitsbergen.

James Poole in 1610 made a hunting expedition into King's Bay and reports finding "Sea-coales which burnt very well." The Diary of the Seven Sailors, who perished in trying to live through the long Arctic night of 1633-34, speaks of Jeroen Carcoen, the strongest of them bringing in *Kolen om vyer aen te leggen*—Coals to put on the fire.

Captain Scoresby, Jr., who published in 1820 his account of whale fishing in the waters of Spitsbergen, speaks of the coal on the main island. He says:—

"The coal is found near King's Bay of a tolerable quality. It is so easily procurable that many of the Dutch fishers, a few years ago, were in the habit of laying in a stock of this useful article for fuel, on the passage homeward."

During the early part of the last century many sloops and schooners from Hammerfest, then the northernmost town in Europe, visited Spitsbergen and brought back cargoes of eider-down, seal, white whale, sharks' livers, bear, walrus and reindeer. As early as 1773 the British began a systematic exploration of the shores for the purpose of mapping the bays and harbors and reporting on the conditions of navigation. But no attempts were made for more than a hundred years to penetrate into the interior. A part of the main island was crossed by wrecked walrus-hunters some time before 1869, but they left no record of their experiences. Only the animal life seemed to have attracted attention.

When, a little later in the century, scientific expeditions went up from Sweden and Germany, their activities were confined to studying the general geological structure of the

archipelago, its flowers and shrubs, fossil and living, its vanishing herds of seal and walrus and reindeer, its enormous flocks of noisy birds, its changing climate and diminishing glaciers. There are plenty of references to coal in the various reports and articles, but apparently without thought of mercantile exploitation.

Pioneers in Exploration. A few of these, without attempting to make exhaustive collation, will perhaps suffice. The pioneer of scientific explorers in Spitsbergen was Balthaser Matthias Keilhau (1797-1858) Professor of Geology in the University of Kristiania. In 1823 he visited the archipelago and related his experiences in a remarkable book entitled "Resen i Ost og West Finmarken" ("Travels in East and West Finmark") published in 1831.

A geologist named E. Roberts, who accompanied the *Recherche* Expedition to Spitsbergen in 1838 and 1839 printed a statement that the coal found in Schoonhoven (Recherche Bay) was of the same quality as that which had been for some years taken out of the Ice Fjord for use in the iron-mines in Kaafjord in Finmark. The quantity mined in those early years could not have been very great, otherwise there would have been more manifestations of such activities; there would have been scars of extensive operations had such occurred.

In 1837 Professor Sven Lövén began a systematic geological exploration, and was followed by many others. It is said that from Sweden alone nine expeditions went up between 1858 and 1896. It is odd that they so neglected the coal!

In 1866 Oswald Heer communicated to the Proceedings of the Royal Scientific Academy a paper describing the researches of A. E. Nordenskjöld and C. W. Blomstrand among the fossil plants of Spitsbergen. These scientists attributed to the Miocene period the remains of berries and leaves of trees found in what they call the Coal Mountain (Kolberget vid Belsund), and came to the conclusion that the sixteen species detected must have grown on the spot and that therefore the climate must have been much warmer than it is at the

present time. All these learned professors cared for was to determine the age of the fossils.

Oswald Heer's Report. A more satisfactory or at least more suggestive reference to the coal itself is found in a report to the Swedish Academy of Antiquities on the Miocene Flora and Fauna of Spitsbergen by Oswald Heer in 1869. In this he cites a chemical analysis of black shale found at Cape Starashchin near Green Harbor in which it says that the slaty mass when exposed to clear flame heats but does not burn, leaving a coal-black coke almost like graphite. When heated in a retort it gives forth an inflammable gas. This bituminous coal-clay shale contains only about twenty per cent coal. Higher up on the mountain it changes to lignite in beds of considerable thickness and is closely allied to the coal of King's Bay as well as of Atanekerdluk in Greenland.

Coal at Green Harbor and Advent Bay. The same report relates how Blomstrand found in 1861 a stratum of coal on Heer's Mountain on the eastern shore of Green Harbor at a height of seven hundred feet above the sea, and it was noted that a similar coal-bed, "presumably a continuation of the strata near Green Harbor," cropped out at about the same height in the perpendicular wall west of the mouth of Advent Bay. Of course it is now known that it is not the same coal. It seemed to the investigator that the surface was composed of a mixture of ice and coal. Other strata were discovered in several places between Green Harbor and Advent Bay, and it was seen that in one place the coal-bearing beds reached the sea-level. Thin strata of coal imbedded in limestone were found on Cape Boheman separating North Fjord from Ice Fjord proper, and on the Coal Islands.

A. E. Nordenskjöld's Investigations. Professor A. E. Nordenskjöld furnishes a profile of the Coal Mountain. What he called "insignificant coal-strata" were probably so designated because not rich in fossils, for in a later paragraph he says: "I cannot positively decide whether the large lumps of coal which I have dug out from very deep under the gravel at an altitude of five hundred feet above the sea were actually—as I

have reason to suppose—formed there or were tumbled down from strata lying still higher."

In 1858 he was prevented by deep drifts of snow from establishing the profile of the strata on Cape Starashchin, and he felt certain that if the coal had been visible he would have noticed it. But the innumerable pieces of it strewn along the shore caused him to predict that the crushing and scouring process of the glaciers and glacier-streams would within a few hundred years quite obliterate the Tertiary formation in that locality. He thought it probable that the same kinds of strata may have stretched entirely across Spitsbergen, hunters having reported that on the shore of Thymen Strait on the Eastern Coast pieces of coal were found in abundance along the glacier-streams.

5. SCIENTIFIC RESEARCHES

In 1861 C. W. Blomstrand, a member of the Swedish Expedition of that summer, contributed to the Transactions of the Royal Academy an article relating his experiences during a ten days' stay of King's Bay during which he claims to have discovered or rather to have rediscovered extensive coal-beds and he expressed surprise that so little information or even tradition had been accumulated, especially when its recurrence had given names to several localities. The article was translated into German and published in 1865 in Petermann's "Geographischen Mittheilungen," but many years elapsed before the Germans, even in their eagerness to annex the whole earth and all that is under the earth, became particularly interested in the commercial possibilities of Spitsbergen. What Blomstrand had to say is well worth reproducing:—

C. W. Blomstrand's Discoveries in 1861. "From old Spitsbergen fishermen who every year were in the habit of putting in at the fjords and harbors, and who might have been expected to find coal, I was unable to obtain the slightest indication that there was any actual knowledge of its occurrence. Of course it is possible that in the days when whaling was a

great industry, more was known about it; but if so the old locations were quite forgotten.

"Having noticed a quantity of float-coal on the seashore just below the eastern-most limestone mountain, I was prompted to discover where the original coal-seam was. Larger lumps found scattered along the brooks by which the valley was criss-crossed, suggested that it might be in the black mountains beyond the glacier.

"I climbed with great difficulty the extraordinarily lofty glacier which apparently rested on the under side of the limestone mountain, and thus was enabled to investigate that portion of the mountain from which the glacier obtained its chief nourishment, and likewise the colossal moraine formed by the disintegration of the same. There was no sign of coal; nothing but limestone and, higher up, the dark strata of slate forming the bulk of the mountain.

"I had given up all thought of finding the coal when I detected in the angle between the mountain and the great glacier just mentioned, where it borders on the farther side, a small section of the mountain laid bare by the glacier-stream. I examined it and found that the coal-bed was plainly visible. The results of this and also of later and more accurate investigations are here communicated.

The Trend of the Coal-Bed. "From the angle between the Coal Mountain (Kolfjell), as I will provisionally call the foremost black mountain next to the lighter colored limestone mountain on the western side, and the glacier on its lower slope, where the coal-seam first appears, it generally follows, as far as could be judged from the various outcroppings, the strata characteristic of that region in a direction of about 30° west, obliquely to the ocean.

"As it emerges under the glacier from the higher mountains, which circumstances prevented me from subjecting to a closer examination, it keeps its course down into the smooth, gently-sloping valley which here, just as on the whole southwestern side of the bay, separates the glaciers and the intervening mountains from the seashore. Bed rock was very

rarely found in place in the more or less considerable layers of talus and stone with which the flat beaches were covered.

"Almost the only opportunity for reaching it, except where it here and there lies exposed on the beaches, is afforded by the brook-channels or by the glacier-streams, and they rarely wear away to any considerable depth except at the points where they burst forth from under the ice, for they usually spread out over a broad area in a host of smaller branches.

Extent of the Seam. "Guided partly by the direction of the 'strike,' and partly by the lumps of coal found sparsely scattered among the stones, I succeeded in locating the seam in four places besides the one where I first discovered it; so that it formed a tract of about seven thousand feet in all, though there can be little doubt that it extends still farther along the level shore.

"Only the first of all these five places afforded any opportunity to examine the associated strata of rock, for there the torrent gushing forth violently had made a deeper cut; in the other four the mountain had been greatly disintegrated and was covered with broken fragments and only the coal, being comparatively more resistent, kept its form.

"Next the coal, both above it and below it, and to some extent between the various strata, were layers of sandstone, some of it of a dark-brownish color and mixed with fine scales of mica with a considerable number of plant-impressions; same of it coarser in structure and lighter in color, looking reddish-yellow in the sun and with few fossils.

"Then came a coarse-grained conglomerate with lumps of black rock (hard clay-slate). The strata of coal next following were almost perpendicular and slightly contorted; they were separated by a hard black slate rich in coal. Farther to the east it was impossible to determine accurately the dip and thickness of the coal-seams alternating with sandstones, since they come to light only at the water's edge where the strong current had eaten away the layers of talus. The dip is apparently far less than in the larger coal-strata.

"The section to the west of the principal seam was buried

under masses of moraine but apparently consists of sandstone; then came a stratum, about two hundred and fifty feet thick, of a beautiful bright blue-green clay-slate, alternating with more or less attenuated strata composed partly of a hard, blackish-gray, rocklike sandstone which looks reddish-yellow in the sunlight, and partly of a dark-gray marl schist. In the clay slate were a very few scattered fossils, apparently almost without exception remains of fishes."

After a paragraph or two devoted to discussing the probable origin and nature of this peculiar rock-formation and showing that the sandstone lies above the limestone which forms the bed rock of the coast, he goes on to describe the coal-strata:—

Approximate Thickness of the Coal. "The exact thickness of the coal-beds could scarcely be accurately determined for it would have been necessary for a more complete investigation to dig down from a foot to six feet through the superimposed talus and rock along the whole extent of the coal-bearing strata. With inadequate tools, and with the limited assistance at my disposal, I had to be satisfied with an approximate estimate. On the other side it was evident that the coal-seams varied at different places not only in thickness and in dip of the beds but also in the quality of the coal.

"At one point, in the channel of a dried-up glacial torrent I succeeded in exposing the coal-seam in, as far as I could see, an almost uninterrupted stretch about eight feet wide. The dip of the seam appeared to be about 60° as far as it was the natural boundary of the coal-bed which I had the good fortune to discover on that one side.

"Since the coal found in the first position was evenly compressed into a trough of thin schist, it was easy to hammer off lumps of a cubic foot and more in size. Whether this coal-seam, which seemed to be, and probably is, the thickest of those that I found, is accompanied by others in subordinate positions could not be determined by experiment, for the superimposed layer of talus was too deep to dig through.

"One might perhaps be inclined to the theory that the thick-

ness of the coal-seam at the place indicated was only apparent and came from an accidental folding of the stratum, the convex upper side of which was exposed. The apparently regular break in the sandstone layers which crop out a few yards farther toward the sea would, however, make it more probable that the seam here is actually a direct continuation of the three noticed in the first locality with the single difference that the sandstone schists separating them are diminished to narrower strips.

Its Tenure. "The finest coal was found at a place where the bed crops out from under the mass of talus three times within a distance of thirty feet along the side of a glacier torrent. Here it was a shiny black with splintery tray-shaped fractures and occasionally showing a clearly woodlike texture. That found in the glacier stream was not so brilliant or so splintery. Surfaces exposed for a long period to air and moisture have frequently a light, brown-rust color. This coal burns with extraordinary facility with a bright, yellow flame and is almost completely reduced to ash.

"According to Scoresby the Dutch used to get coal from King's Bay for use on their vessels as they sailed back to Holland. So one might expect to find mines which were formerly worked; yet at not one of the five localities where I found an outcrop of coal was there the slightest indication that they had ever been disturbed by the hand of man.

"I looked in vain for coal in any cleft toward the north where the seam trends, and judging from its direction toward the south, it must be covered with glaciers or crop out on practically inaccessible mountains. There is indeed a possibility that a quite different bed of coal may exist in some other location on the bay, although if I may draw any conclusions from my own far-from-exhaustive investigations of the fjord, there is little likelihood of such being the case. It is most probable that the collection of coal has been confined to the seashore and particularly to the broad stony beds of the glacial streams. On a short stretch of the stream mentioned above, even today a good many bags of coal could be picked

up, and naturally it must have been much more abundantly scattered about in the days of old before it became an object of consumption. Such a theory accords well with Scoresby's statement that the coal was easily procurable, and on the other hand is the only natural explanation of the remarkable fact above-mentioned that the location of the coal-bed should have remained so completely unknown until so recent a time.

Practical Utility of the Coal. "It remains to consider the technical value which the discovery of this coal may have for the future and this can be summed up in a very few words. Unfortunately these beds of coal are on Spitsbergen. Even if they were far richer and more accessible than they are, one single circumstance is of such far-reaching significance as to render their worth wholly nugatory: to transport the coal from there to Norway, which as the nearest country would be the only one to consider, would hardly appeal to any speculator since the price obtained for it evidently would not cover the cost of labor and freight. The mine can be utilized in but one way—as a source of supply for the great numbers of walrus and seal hunters who visit Spitsbergen every year and could thus be supplied with the fuel they require.

"It may indeed be objected with some reason that there is a supply of fuel more easily procurable in the driftwood found along the shores; but if I may be permitted to judge from my own experience the abundance of driftwood is by no means so great as it is usually represented to be. In the first place, its presence is quite accidental and depends on local conditions; for example, on the configuration of the shore, for it is essential that the coast be low enough for the driftwood to be thrown up on it. If the shore be high and rocky, as for example, with few exceptions, at both Cross Bay [Close Sound or Ebeltoft's Harbor] and at King's Bay, it would be waste labor to look for it.

"In the second place the supply of driftwood must unquestionably diminish from year to year in the localities more frequently visited, for judging from the extremely rare sight of trees floating in the sea, one is hardly justified in supposing

that a new supply will be afforded to take the place of that which has been used up. The fact that in favorable localities, as for example in the rarely-visited innermost inlet of Wijdé Bay, heaps of driftwood are found piled upon the shore can not be regarded as a contradiction when it is realized that the supplies now found in such places are, so to speak, the accumulation of centuries. Decay seems to be extremely slow and it is perfectly possible that a log which when cut into with an ax shows as green as ever it was, may have been lying in the same spot for centuries.

"However this may be, there can never be too great a supply of anything that is absolutely necessary, and in a climate like that which prevails in Spitsbergen, fuel must be regarded as the most indispensable of all things; when we realize that not infrequently men voluntarily or under compulsion winter there it must be evident that instances will occur when the knowledge of the existence of coal will be valuable.

Bunker Coal for Steamship. "There is one way, however, in which the coal at King's Bay might be of direct service. Walrus and seal hunting is becoming less profitable every year. A thoroughly systematic management of this business is therefore the more necessary if there is to be any profit on the capital invested. Now steampower will be imperatively required if vessels are to continue visiting the Spitsbergen waters just as it is in the case of the whale-fisheries in the American waters. Time is precious in the short Spitsbergen summer and our own far-from-agreeable experience is a sufficient proof of how much delay is caused when one has to depend exclusively on the fickle wind for getting on. One chief obstacle which until recently prevented the use of steamboats in the Spitsbergen fisheries has been overcome, since it is now possible to take on coal at various places. In connection with this I will call attention to certain advantages in the situation of the coal-bed at King's Bay by which its use might be considerably facilitated.

Facility for Mining. "The seam actually or approximately comes to the surface for a distance of at least a mile

and a quarter with an escarpment perpendicular or approaching it. For mining, as far as such an undertaking can be considered here, nothing more is needed than to strip off the talus with which the seam is covered, to break out the coal as long as it is convenient and then proceed to another place. It is as easy as one could wish to get it down to the water. At the fourth place it is at most only a ten-minutes' walk over a gently-sloping valley where the stones lie uncovered only in the beds of the streams. If the coal were situated in a country farther south and actual mining operations were under discussion, it would be necessary merely to build a simple railway from the shaft to the sea: this could be done with the greatest facility on the even ground, and the loaded cars would glide down by their own gravity.

"Finally, it happens by a peculiar coincidence that immediately in front of this coal district is situated one of the safest harbors in Spitsbergen for small vessels drawing about fifteen feet, protected from every wind by a horseshoe-shaped island which lies in front of it."

Bloomstrand's far-from-enthusiastic presentation of 'his great discovery naturally had slight effect on possible exploiters. The time had not as yet arrived for Europe to go so far afield for new supplies of coal.

6. COAL AT ADVENT BAY

Eleven years later, in 1872, Professor Richard von Drasche discovered at the entrance to Bell Sound a vein of coal exposed by the bed of a brook. He says:—

"First came clay, then a two-foot vein of black, friable, pyritic coal, then a foot and a half of quartz conglomerate, then a thin stratum of conglomerate, and finally, fine-grained sandstone with coal-streaks and lumps of coal commingled."

He judged that on these coasts of Spitsbergen where although no Tertiary beds were to be seen, so many of the glacial brooks brought down lumps of coal from the interior, there must be a wide distribution of such beds. He found also between Advent Bay and Sassen Bay bits of a characteristic

coal of a dull black with a decided conchoidal fracture, the surfaces showing shiny black faces as if they were coated with shellac, but he failed to locate them in the Tertiary strata overlying the Jura. This coal was brown and burned with a blue flame, and gave forth an aromatic odor.

Nathorst's Casual Mention of Coal. In 1882 Professor A. G. Nathorst while engaged with Baron de Geer in the geological survey of Spitsbergen, came upon various outcroppings of coal, but he was more interested in fossils and in determining geologic ages than in practical questions of utilizing the stored-up treasures of the mountains. He casually mentions in his report to the Swedish Academy of Sciences, published in Stockholm in 1884, the coal-strata discovered by Blomstrand as giving many Tertiary plant-impressions, and says that he discovered near Coles Bay "a very extensive bed of coal which had not been previously known."

"The water along the shore is very shallow," he remarks, "and for that reason boats can not approach. The coal is found in two seams separated by a stratum of scales and chips (*Flis*) forty centimeters in thickness; the upper coal seam is seventy, the lower sixty, centimeters thick, together making 1.30 meters. We used some of this coal on the *Bjona,* but it did not burn so well as that from Cape Lyell."

In two or three other places Nathorst mentions coal. In speaking of the advantage which scientific expeditions would find in taking along a steam launch, he says:

"Beside the fact that the boat-trips would be materially facilitated by it, the launch could be used as a tow-boat for the vessel. Then, too, it is a fortunate circumstance that coal-strata are found at Ice Fjord as well as at Bell Sound, where necessary coal could be provided for emergencies; likewise the abundant driftwood could serve as fuel in case of need."

On the inner side of Cape Lyell in the vicinity of Recherche Bay, where he went ashore to examine rock-strata described by Nordenskjöld in 1875 as rich in fossil vegetation, he discovered a small deposit of coal which proved itself as advantageous for use in an ordinary kitchen-stove. Baron de Geer

also discovered coal-deposits on Middlehook facing Van Mijens Bay, and characterized them as accessible; but he too was more interested in the "pretty plant fossils" it preserved than in the value of the fuel.

Coal on the Shores of Ice Fjord. Again Nathorst, while on a trip in search of an inland lake west of Advent Bay, after wandering up over a plateau and a mountain eight hundred and ninety meters in height "came to a place where small coal-strata were in place, the coal full of plant fossils." In the vicinity also of Safe Harbor, toward the north, he found bits of coal indicating seams on the headland; a snowstorm prevented him from making investigations. But just before the early setting in of winter he made an excursion to Cape Heer on the shore of Ice Fjord in order to examine a bed of coal there. He says: "It is a meter thick and as the coal is good, it is now used by a large number of sailing craft. When we got there the crews of several vessels were engaged in breaking out the coal and the strata are much more exposed than when Nordenskjöld examined them."

Other mention of coal-discoveries in Spitsbergen during the next twenty years are so trivial as to be scarcely worth chronicling. It has no significance that Dr. P. Couteaud mentions in his report to the "Nouvelles Archives des Missions Scientifiques et Littéraires," in 1893, that he had discovered during a voyage to Spitsbergen the previous summer, a coal-deposit on the southwest side of Advent Bay, especially when it was only the rediscovery of what Lamont had chronicled a third of a century before.

Sir Martin Conway's Casual References. Dr. R. N. Rudmose Brown in an article on "British Work in Spitsbergen," published in the "Scottish Geographical Magazine" for April, 1911, speaks of the two months spent by Sir W. Martin Conway in 1896 as "one of the most important and fruitful expeditions in the history of the archipelago." Yet Sir Martin seems to have had at heart only the interests characteristic of a confirmed mountain-climber. In his book, "The First Crossing of Spitsbergen," he mentions coal only three

times. The first is in an extract from a Norwegian paper relating the experiences of a hunting party which had wintered on the island and which had kept warm by means of three and a half barrels of coal procured from "the little valley behind Advent Point."

The second is a mere mention of noticing fragments of coal in the "drainage débris of three valleys leading down to Advent Bay. The third is a brief mention of the runaway pony, Spits, set to work drawing a sledgeful from the Advent Bay coal-supply. There is nothing else; nor is coal deemed worthy of finding a place in the index of Sir Martin's otherwise useful treatise on what he calls "No Man's Land," published ten years later. Yet the time was all prime for a great development of this neglected treasure.

A Norwegian Fiasco. Possibly one explanation of the small interest taken by Norwegians in the coal-supply of Spitsbergen may be found in the fact that just before the close of the nineteenth century Herre Michelsen, then Prime Minister, spent about fifteen thousand dollars in a practical investigation of the possibilities there, but soon abandoned it on account of the high cost of mining it and because the coal which was produced proved to be of a quality poorer, it was reported, than the worst Scotch coal. Such a fiasco was certain to quench any enthusiasm on the part of capitalists.

II. THE FIRST ENTERPRISE AT ADVENT BAY

1. THE EARLIER CLAIMS

DURING the last decade of the nineteenth century it became fashionable for tourists to visit Spitsbergen. This was the most available part of the high Arctic latitudes for summer excursions, and the great steamship companies which had in times past offered the North Cape as the limit of travel into the regions of the Midnight Sun, found an even more powerful lure in the Ultima Thule whence it seemed so short a flight—only six hundred miles—to the Pole itself. In 1896, the vessel that took Sir Martin Conway and his party to the "North of the Midsummer Night," carried materials for an inn at Spitsbergen. This was furnished complete at one of the largest timber works in all Scandinavia. Sir Martin says: "The hillside harvests of the woods are gathered and wrought into every form. You can buy a ready-made house as easily here as a wooden trunk. The building was all ready, was in fact standing in the yard, its two storeys in separate places. To pull it to pieces, load it on trucks and run them along the railway and the wooden pier to the steamer, was not a half day's work." After that year the inn, standing on the plain at Advent Bay, was one of the sights of Spitsbergen; but it seems not to have been a very successful venture as a hostelry and ultimately became a part of the coal industry of the place.

Three years later Captain Sören Zakariassen had the enterprise to load a small schooner with coal from Cape Boheman on the north side of the Ice Sound, and brought it back to Norway. Captain Zakariassen himself wrote a brief account of this venture in which he mentions several persons whose names will later occur with considerable frequency:—

CAPTAIN ZAKARIASSEN'S VENTURE. "In the summer of

1899 I sailed from Tromsø in my sloop the *Gottfred,* to Spitsbergen, where I mined a cargo of coal on Kap Boheman, and which I the same fall brought to Norway and sold there. This was the first cargo of coal ever brought to Norway as a commercial venture.

"On the basis of this cargo of coal there was started the following winter a joint stock company in Kristiania, which was called "Kulgrubekompagniet* Isefjord," wherein I became a part owner. This company fitted out a new expedition, which in the year following, 1900, sailed to Spitsbergen, likewise in my sloop, the *Gottfred,* of which I myself was master. This was shared among others by one Andreas Schröder, who was not with me in the year 1899, and by a young engineer, Nilssen, whose first trip to Spitsbergen this was, and who this year accompanied us as a sort of a technical leader.

"Passing by the history of this expedition in other places, we came during the summer to Advent Bay intending to occupy coal-lands, but there (on our arrival) we found that the coal-fields were already occupied by another company known as the "Trondhjem-Spitsbergen Kulkompagni," members of which we knew were one Henrik Naess and one Oluf Mads Olsen.

"We found these men's sign-posts on the property and their fence, and I followed personally the rope laid down there by the above "Trondhjem-Spitsbergen Kulkompagni." It is therefore beyond any doubt established that our company, "Kulgrube Kompagniet Isefjord," was the first to come to Advent Bay; after that coal lands there were occupied by the Trondhjem-Spitsbergen Kulkompagni."

The Trondhjem-Spitsbergen Coal Company. The excellent quality of this coal and the facility in mining it induced certain citizens of Trondhjem to form a company which proceeded to lay claim to the tract of land where it was situated. One of the founders of the Trondhjem-Spitsbergen Kul-

*In Norwegian the definite article is often appended to the noun which it modifies. Thus *Aftenposten,* "The Evening Post." *Kompagniet,* "the company." To say "the *Aftenposten*" is like saying "the la grippe."

kompagni was Captain Henrik Naess, who, together with mining-engineer Alfred Getz and machinist Jacob Grønvald went to Spitsbergen in the summer of 1900 on a schooner named *Depenten,* the owner and skipper of which was Oluf Mads Olsen. They anchored in Adventure Bay, more generally known as Advent Bay, and took possession in the interest of the company of a tract which according to a document deposited with the Department of the Interior of the Royal Norwegian Government covered an area of one hundred seventy-eight thousand, five hundred and fifty-six square kilometers (one thousand, four hundred and six square miles). Its boundaries were thus described: "Beginning from the middle of the sound in a straight line northeasterly from the entrance to Advent Bay to the lower end of Advent Valley; then following this valley to the first gulch from a southwesterly direction and then following the gulch to the higher mountains. The boundary line continues along the mountains in a southwesterly direction along the valley or gulch which gradually sinks down to Coal Bay [Coles Bay] and turns toward it. The southern boundary line is formed by a river and by the shores of Coal Bay. The boundary line on the west is formed by the Ice Fjord." The land, continues the report, is somewhat broken and uneven toward the Ice Fjord, with elevations up to two and three hundred meters. The heights are usually covered with snow, ice ponds, and streams. The chief or main entrance to the land occupied is by Advent Bay, but it can be approached from Coal [Coles] Bay.

Skipper Oluf Mads Olsen also wrote an account of his connection with this, the first mining venture in Spitsbergen. He said:—

"In the year 1900 I went from Trondhjem to Spitsbergen as skipper of my sloop *Depenten,* chartered therefor by a company in Trondhjem, known as the 'Trondhjem-Spitsbergen Kulkompagni,' the representative of which, one Henrik B. Naess, was on board.

"In the course of the summer our expedition ran into several places, such as Green Harbor, Coal Bay, Cape Bohe-

man, Sassen Bay, King's Bay, Safe Harbor etc., but passing by the history of the expedition in these places, we arrived in Advent Bay for the first time on June 18, 1900, where the ice still lay. We rowed therefore between Advent Bay and Coal Bay, and broke out some coal, and made on foot a trip into Advent Bay proper. On June 24, 1900, we anchored in the harbor of Advent Bay, and prospected then and thereafter repeatedly for coal on the premises, which resulted in finding what we thought were very promising fields of coal. These we fenced on July 25, 1900, with iron poles and rope, and set cairns with signs on during the summer. Some of the iron poles had iron sign plates fastened to them, on which was written:

PRIVAT EIENDOM
KUL-KOMPANIET
TRONDHJEM
SPITSBERGEN
25-7-1900

"We exposed the thickness of the coal-veins with shots of dynamite and left Advent Bay for the last time on August 15, bringing with us to Norway samples of coal."

Indication of Land-Claims. The Norwegian Government exercised no authority over Spitsbergen, and the filing of this claim was therefore merely a matter of record. As there was no legal method of securing title the primitive expedient of "staking" whatever tract of land was claimed had to be adopted. The memorandum therefore announced also that corner posts and monuments had been placed at Advent Bay and at the entrance to Advent Valley, and signboards had been set up where coal had been discovered and where work had been performed. They claimed to have made in one place a tunnel seventeen meters deep, and at another a cut of about two meters. The memorandum ended with a list of the founders of the coal company.

That same summer of 1900 Captain Zakariassen took another party to Spitsbergen and among them was a man named Schröder and a young engineer named Nilssen, who after-

wards, by asserting counterclaims, caused a great amount of trouble and annoyance, in spite of the fact that Captain Zakariassen testified to his having on various occasions found Captain Naess's name-placards and followed the line stretched between them. Prospecting for coal was by this time becoming a pleasant occupation for rival adventurers, and although nothing resulted from their enterprise, their claims and counterclaims, often overlapping, proved during the next ten years to be a serious factor in hindering the development of the industry which Mr. Longyear was destined to make so notable. We have now to relate the romantic initiation of that remarkable work.

2. A MOMENTOUS VISIT

In the summer of 1901, Mr. John M. Longyear, of Marquette, Michigan, with his wife and daughters Abby, Helen and Judith and sons, Jack and Robert, made a holiday journey on the Hamburg-American steamship *Auguste Victoria* to the North Cape and Spitsbergen. As this chance visit was fertile in big consequences, the passages from his diary describing his first impression can not fail to be interesting. Under date of July 14 he writes:—

Mr. Longyear's First Sight of Spitsbergen. "About 9:30 A.M. land came in sight. Steep, rocky crags and peaks, covered or streaked with snow. Heavy clouds hung over the sky and shrouded it, many of the peaks being entirely hidden. Veils of rain and mist drifted across the panorama, driven by a bitterly cold wind. It was a grandly desolate, sublime, weird landscape, utterly barren and unlike anything I had ever seen. The sun seemed to be boring holes through the clouds, for we often saw bright spots on the hills and we expected our usual supply of good weather, when there is anything to see. About noon we turned into Bell Sound and soon after noon we came to anchor at the head of the Sound between two glaciers which came down into the water on either side. After some delay in arranging a landing-place, the launches ferried us to the south shore, and the excursionists scattered over the region.

"When we got ashore, Jack and I made for the glacier. We followed the trail of those who had gone before us, passed two little board huts containing supplies for fishermen in distress, and climbed to the top of a glacial moraine two hundred or three hundred feet high. Beside the huts are several graves and wooden cross bearing the inscription:

'THESE GRAVES RESTORED BY
H.M.S. Calypso, 1875.'

VISIT TO A GLACIER. "When Jack and I reached the edge of the glacier, we saw a lot of people far out on it, but I wanted to get photographs of the front of it before the tide rose, and we followed along down the edge to the shore. There was a beach for several hundred feet along the foot of the ice-cliffs and we hurried along this as we did not want to get a soaking. At one place a cascade fell fifty or sixty feet over the ice cliffs, issuing from a cleft or cavern in the front of the glacier. Blocks of clear, transparent ice, which had fallen down or had floated here, lay along the beach, many of them having fantastic shapes. One looked like a huge swan just alighting in the edge of the water. On the face of the cliffs, where the ice had broken off, the green and blue ice colors were very fine and this I photographed. We had plenty of time to get back to the wide beach. Little lumps of ice continually fell from the ice-cliffs and suggested that big ones might also fall (but they did not) and we were easier when we had left the glacier behind. It was a wonderful sight and well worth the rather moist walk. Mary saw from the steamer a great mass of ice fall from the opposite glacier into the water with a mighty splash, the waves of which rocked the steamer. I estimated the cliffs that I photographed to be from a hundred to one hundred and fifty feet high, and the glacier is probably half a mile wide where it enters the bay.

"Captain Kaempff says that he has been here eight times and never saw so much of Spitsbergen as we have seen today. It began to rain again about the time we left the glacier, and kept it up all the morning. The bare ground was soft and

mushy like our soils when the frost is just out in the spring. In places there are patches of a fine moss with a very pretty deep-pink flower; but there seemed to be very little other vegetation. Our Norwegian pilot tells me that there are many wild reindeer, foxes, Polar bears, and other animals on Spitsbergen (which, by the way, is well-named, as it means 'Sharp Peaks or Mountains').

A Mineral Country. "The rock in the glacial débris seemed to be slate and slate-conglomerate with much quartz. It looks to me like a gold country. There was a small vessel in the Sound and our pilot told me that the men in it were here prospecting for coal. Spitsbergen now belongs to no country, and if coal or gold are found here some nation will hasten to colonize it.

"We left about six o'clock and had 'Captain's dinner' at seven. One course was 'reindeer leg,' and I suspect that the poor deer I saw struggling with ropes around their necks at Tromsø furnished the legs.

At Advent Bay. "I saw a whale today cruising slowly along near the ship." The next day the *Auguste Victoria* anchored in the bay named after the Hull whaling adventurer, Whitwell's ship the *Adventure,* which was there in 1656. It is now generally known as Advent Bay, the third harbor on the southern side of the wonderful Ice Sound or Ice Fjord.

Little did Mr. Longyear realize what a change he was destined to bring about in that desolate region! When he went on deck at eight in the morning it was still raining. He says:

"The water of the bay was so calm that it reflected the shores. The tops of the hills were hidden in clouds hanging low. Ice in many places came down the hillsides to the water's edge. One quite large ship (about like the *America*) named the *Antarctic,* a small steamer (*Express*), a sailing craft of one mast, and a fishing boat, lay at anchor near us. On a low point of land is a small house, erected for a tourist hotel by some Norwegian steamship lines. We are to lie here all day so as to allow the nimrods to hunt.

"About eleven in the morning, Mary, Jack and I went ashore in the rain. We went along the beach of slaty gravel. The stones made fine 'skippers' and I skipped a good many. From the beach we went to a ridge about two hundred yards back where there are various signs, metal flags and the like, recording the visits of various ships, yachts and other craft, and also several graves. A little farther on was the ruin of a hut in which, we were told, four shipwrecked sailors and hunters spent four months, only one of the four surviving until rescued. The ground was soggy and wet, and the soaked ruin looked forlorn enough. It had been made by digging a hole about ten feet square and four feet deep in the ground on the brink of a ravine where, forty or fifty feet below, ran a stream of fresh water. Rafters had been covered with canvas, shreds of which still hung from them. An old ship's cabin-door was still in place and a broken ship's window was on the ground. The old bunk of boards was still standing.

"Continuing our walk, we turned toward the north (?) end of the point of land, passed the little black hut built for a shelter for unfortunate fishermen by the German Fishermen's Association, and came to the small building built for a tourists' hotel, but it is closed and the windows were nailed up. Some dogs, confined in a shed adjoining the hotel, made a great hullaballoo, which Jack and I encouraged by mocking them.

"On the landing place, near the hotel, were some hunters who had the only souvenirs to sell that we saw. I bought some Spitsbergen stamps which do not pay postage. They also had postcards, three Polar bear skins, and other furs. The heads of the bears looked sleepily at us from the barrels in which they seemed to be pickling. A tripod of three oars, supported three carcasses of reindeer which are said to abound here. It rained hard all the time we were ashore, but this is said to be good weather for Spitsbergen.

"The *Antarctic* proves to be the ship of the Swedish Polar Expedition. The hunters are said to have been here for a year and are anxious to leave; and I should think that they

might be! During the afternoon all their plunder was brought off and put aboard our ship and the men also. I saw seal skins, Polar bear skins, reindeer skins, etc., in bundles, but most of their 'stuff' was in barrels, of which there must have been fifty. . . .

A Violent Squall. "While we were at luncheon I heard a noise as of the clamor of many voices and left the table to look out and see what it was. I found that a violent squall was blowing against the side of the ship. The fine rain continued and the little drops cut like shot. When Robert and I were ashore the wind and rain continued but the rain was less in quantity. The wind was very strong and cold. I walked up the beach for a mile or so and saw nothing but desolation and a few birds. The gulls and snipe would allow me to come within twenty-five feet and only moved away a little at a time. They seemed to have no fear of me.

A Relief-Ship. "Just as I started on the walk a small vessel came rushing into the bay before the gale. She ran around the other vessels and came to anchor near our landing-place. She proved to be part of another Polar Expedition. The ship had left the chief and one man in a hut about two hundred miles north of Advent Bay, and had sent this boat for supplies. She had expected to be gone a long time, and to go to Norway or perhaps to Hamburg for the supplies, but our ship was able to let them have what they wanted. A lot of clothing, books, and other supplies were also sent.

"After three o'clock bright spots appeared on the distant hills and we could see that the sun was shining somewhere in sight all the rest of the day but not just where we were. The snow peaks and glaciers on the northwest side of the fjord were in good light all the afternoon. From our ship we could see seven glaciers at once. It was a bleak and wintry scene but majestic and sublime. Occasionally the dense clouds that covered the tops of the peaks near us would drift aside for a little while and showed the upper parts of the hills covered with newly fallen snow. So what had been rain with us was snow on the hill tops.

THE S. S. "ANTARCTIC" IN ADVENT BAY

LAPPS IN TROMSØ

"The captain and his officers had the members of the Swedish Expedition to dinner, and we passengers looked them over with much interest. They were a fine-looking lot of men. The speeches that were made were in German, so I did not appreciate what little I heard of one. The Swedish guests were sent off to their ship in one of our launches. As they left our ship, our band played the Swedish anthem; they uncovered their heads in the wintry wind (it was snowing rather persistently at the time). We all cheered, with the German 'Hoch! Hoch!' punctuated by the shriller Yankee hurrahs and yells.

A Glorious Panorama. "Our launch returned and was hoisted aboard; the anchor was raised, and at one in the morning in full daylight we left Advent Bay, and steamed slowly down Ice Fjord past the Seven Glaciers we had been looking at and two more came in sight at once! Once we saw the sun for a moment, and nearly all the time it made bright spots on the water of the fjord (which was generally gray, reflected from the clouds overhead), or on the snow-covered peaks and glaciers. It was one of the most glorious panoramas possible to imagine. Occasional patches of brilliant blue sky to the northwest, with the clouds moving toward the sun, high in the *north,* led us to expect a burst of full sunshine. It did almost shine on us several times, but not quite. As we gazed through the holes in the rapidly moving fogs and mists some of the most weirdly beautiful effects I ever saw were shown and then concealed. The lower clouds were generally level and dark, while those above were illumined and of fantastic shapes, like structures built of fine silver and white silk, shimmering and turning in the light for a moment, and then hidden by the lower dark clouds. Sometimes it almost seemed as if the finite veil was being drawn aside and that we were to have a glimpse of the borderland of infinite glory; and just as we looked, all expectation to see what was about to be revealed, the finite, dark veil again intervened. It was uplifting, thrilling, fascinating, wonderful! The clouds were so close that it seemed but a step from the unreal to the real of the Infinite.

Iceland Poppies. "Before leaving the hunters had returned, and I saw a small reindeer and some good ducks with a lot of gulls, fish-ducks, etc. Helen brought in some small poppies which she had learned were the real Iceland poppies. So the gorgeous, yellow, rose-like flowers we found at North Cape were not the real Iceland poppy after all. The ones found here are both white and yellow and look like poppies.

"It is amazing what a lot of fool-information one gets from one's fellow-passengers on a trip like this! One man told me that he was anxious to see the remains of the structure Andrée built to shelter his balloon which was somewhere on Ice Fjord. I asked one of the stewards about it, and he said that Andrée 'flew' from the east side of Spitsbergen, some hundreds of miles from the Ice Fjord.*

An Easy Run to the Pole. "At Advent Bay we were only about 700 miles from the North Pole, and the most successful Arctic expeditions have only gone about three hundred miles farther north than we have been! Less than one day's run for this steamer in open water! In open water this steamer could run from Advent Bay to the North Pole in a day and a half! We were just about half way to the Pole from the Lofoten Islands, our next stop. We were nearer the northern part of known Greenland than we were to the Lofoten Islands. It seems incredible that any kind of three hundred miles should have prevented determined explorers from reaching the Pole."

The one word "coal" mentioned by Mr. Longyear, but not in connection with his visit to Adventure Bay, was like a winged seed which flies on the wind and finds lodgment to sprout and grow into a mighty tree.

3. BEDS OF IRON ORE IN NORWAY

During the same summer of 1901, while Mr. Longyear was making his first visit to Spitsbergen, interesting and important discoveries were made in northern Norway by prospectors who found enormous beds of iron ore only a thousand

* Both informants were wrong. Andrée's point of departure was on Danes Island at the northwest corner of Spitsbergen.—J. M. L.

feet or so from the seashore and extending for many miles with a width of several miles, and when subjected to chemical analysis by the Government expert proving to have an average richness of about sixty per cent, with mere traces of fosforus and sulfur, and with a practically negligible intermixture of the supposedly deleterious titanic acid ($Ti.O_2$); it was likewise free from manganese, silica, lime, or magnesia.

New Iron Beds in Norway. Before reports of this "find" had been published to the world, private information regarding it was communicated to a Norwegian named Olaus Jeldness, who was living at the time at Spokane, Washington. Mr. Jeldness was regarded as a reliable business man and had obtained unusual experience as a technical miner in the northwestern States and Canada. Mr. Jeldness, believing that a fortune might be made by exploiting these new fields, which were about two hundred and fifty miles northeast of the region where is was, though erroneously, reported that the Rockefeller interests were operating mines of similar ore, was casting about to discover capitalists who might be interested to form a syndicate, either to acquire options on the portions of the tract already located by a Norwegian acquaintance of his, or to locate for permanent possession and exploitation other lands in the vicinity.

Plan of Exploitation. With this end in view he approached Mr. William D. Munroe, a mining engineer, who immediately wrote a letter to his cousin, Mr. John M. Longyear, outlining the plan to obtain fifty thousand dollars, and go with Mr. Jeldness to Norway and, if circumstances should prove favorable, enter upon an enterprise which might be worth millions to those that took advantage of the opportunity. He reported on the authority of Mr. Jeldness that the laws of Norway were particularly favorable to alien land-owners, assuring them "all the rights and privileges that a citizen has," so that a foreigner could "locate or acquire by purchase land to any extent and get a perfect title from the Government."

A Norwegian Capitalist. Mr. Longyear was duly impressed by his cousin's letter, and the two men proceeded to

Norway. They immediately entered into negotiations with Herre Christian Anker, who had acquired twenty-four miles of the iron country, but they found it a difficult proposition to bring him to meet their views. He had an exaggerated idea of the value of his property, and it was his ambition to interest Norwegian rather than foreign capitalists in exploiting it. Moreover certain English parties had been corresponding with him "along the line of forming an English-Norwegian company to work the Varangerfjord mines."

Herre Anker demanded ten million kroner, or about two million five hundred thousand dollars, and proposed that the English company should take one-third of the stock, the Norwegian investors one-third, while he should himself retain the remaining third. The English company, on the other hand, wanted the controlling two-thirds, and, when this was refused, their representative returned to London. Although this deal was not definitely abandoned Munroe had some reason to believe that Anker was more favorably disposed to "the Americans" than to the English. He wrote to Mr. Longyear under date of February 13, 1903, just as Anker was going to England on some other affair:—

Anker Preferred American to English. "We do not believe that the English will be able to do any business with him while he is in London. Of course, we do not know whether or not his price and terms will be suitable if he does conclude to deal with us; but our point now is to keep him from dealing with others. He made the statement to Mr. Laading, his brother-in-law, that he favored the Americans, and if he was sure they would work the property, he would give them better terms than anybody else."

Quality of the Ore. Mr. Longyear's representatives confirmed the report of the enormous extent of the iron deposits at Varangerfjord, though the great bulk of it was "a concentrating ore carrying forty-five per cent iron"; there were bodies of ore up to thirty and forty feet in width running 56 per cent iron. They secured a statement from Professor Vogt of the University of Kristiania that the iron ore

of the Varangerfjord averaged 55 per cent iron, and was free from deleterious elements.

Of course at that season of the year it was impossible to make a personal examination of the iron country, but in the meantime their negotiations with Anker were progressing with characteristic Norwegian deliberation; they got as far as to draw up a preliminary contract.

One of the great arguments in favor of the eligibility of the Varangerfjord deposits was that there were abundant supplies of coal on Andøen (Duck Islands) within easy reach of the prospective iron mines, so that ships from England or from America in passing would make them a natural calling-place. Anker told Munroe that the coal on Andöen was a gas coal and unsuitable for the reduction of iron, but he suggested that on Spitsbergen there were unlimited quantities of coal, some of which was eminently suitable for such purposes as they had in mind.

4. A JOURNEY OF RESEARCH

Mr. Longyear knew of the coal on Spitsbergen from his visit there in 1901. He therefore after consultation with his associate, Mr. Frederick Ayer of Boston, determined to join his cousin and Jeldness in Norway, and see for himself what the prospects were of locating other lands than the Anker property on which they had secured an option either to purchase at eighteen million kroner or to lease also to look into the Spitsbergen prospects. As he was not able to leave America before the middle of June, he wrote that it seemed on the whole better to go up to Spitsbergen and visit the coal-fields there first, and then if all was well to take whatever steps were necessary for tracing the Varangerfjord iron range farther, and, in case it seemed advantageous, for taking up the land in accordance with the laws of Norway.

Accordingly Munroe and Jeldness went to Syd-Varangerfjord which is in Lapland on the northeastern corner of Norway where it is bounded by Russia, and spent some time looking over the iron territory.

Mr. Longyear's Second Trip to Spitsbergen. Mr. Longyear sailed on June 18 from Hoboken on the *Auguste-Victoria* which was booked to take the Spitsbergen trip in July. He secured passage for Munroe and Jeldness from Hammerfest, although (in order to secure the accommodation required) he was obliged to pay full fare for the round trip from Hamburg and return. The big ship was well patronized, among the passengers being his Royal Highness Prince Leopold von Sachsen-Coburg-Gotha, a number of German Generals, and other titled personages and officers of high grade, all of whom took themselves with immense seriousness. The *Auguste-Victoria* sailed from Hamburg on Wednesday, July 1. Mr. Longyear was much amused at the typical German scramble to secure places at the tables: it reminded him of a regular foot ball performance.

They made the usual stops along the coast of Norway, but a good deal of the time heavy clouds or fog hid the magnificent scenery, and it was noticed that as the effect of an unusually severe winter the snow on the mountains was lower down than it had been two years before and the waterfalls were correspondingly magnificent. On Tuesday, July 7, Mr. Longyear saw in the distance what at first he thought was a group of sail boats. They proved to be the Threnen Islands which mark the Arctic Circle like "buckles on a belt." As they crossed the Circle a cannon was fired, and some of the passengers insisted that they could see a broad white line running east and west.

When the ship reached Hammerfest on the 9th Mr. Longyear was the first person ashore, but although he searched through the town he was unable to find any traces of Munroe and Jeldness. He was just on the point of returning to the *Auguste-Victoria* when he caught sight of Jeldness waving to him from the wharf. They had been for two days at a hotel near the landing and did not know that the ship had arrived.

At the North Cape. Late the same evening, though it was of course still perfectly light, they came to the North Cape. A heavy swell was running, and some of the passengers

who had crowded down into a launch were well drenched with spray, to the great delectation of those who were looking down from the deck. Mr. Longyear tells of one German who got a barrel of water all over him, and was so indignant at the shout of laughter that went up from the rail that he looked as if he would like to sink the ship with all on board.

The next day about six o'clock in the afternoon they passed Bear Island, two hundred and eighty-two miles from the Cape, but it was as usual partly hidden by fog. Mr. Longyear in his diary says:—

"It seems to be an unusually rocky tract several miles across, with many tower-like isolated rocks along the coast. It is a haunt of sea-fowl; the air was thick with gulls and with a kind of bird that flies and looks like a duck, except that it has a short neck, is black on all surfaces except the underside which is white. They are known as Guillemots. There were millions of them. I stood at the bow of the ship for a long time watching the stupid birds that were on the surface of the water—probably young ones. They would pay no attention to the ship until it was almost upon them when they would suddenly seem to think that they had better get away: then they would dive. I could often see them dive against the ship; when they came up to the surface in the first wave rolling away from the ship's bow, as if shot from a gun, they would scuttle off like mad. It was a funny performance."

Spitsbergen in Sight. In the morning of July 11 Spitsbergen was in sight. Mr. Longyear says:—"Its ragged, snowy peaks were glistening in the glory of full sunlight. It was a gorgeous panorama of rocks, ice, snow, and water, under a blue sky as we sailed up Bell Sound into Recherche Bay (Schoonhoven), where we dropped anchor about eleven o'clock."

Mr. Longyear with his two friends went ashore and proceeded directly to the glacier on the west side of the Bay, but it was much farther away that it looked to be. On the water front the glacier-ice was more than one hundred feet high, and the moraine at its side was twice as high and was composed

of mud, gravel, shingle and boulders; the sides were as steep as a railway-embankment.

The ship stopped for a while at Bell Sound, and Jeldness got a shovel from the sailors and "panned" some of the sand on the shore. That primitive mining-operation caused the passengers to imagine that the mysterious three were gold prospectors, and an Irishman, whom Mr. Longyear called "The Gentleman from Indiana," thought something was going on in which money might be made, and in his rich brogue he took Mr. Longyear aside and said: "When ye find that goold-mine, let me know, and I'd like to take some o' the shtock."

"All right," replied Mr. Longyear, "I may want some help."

They saw a seal but before they had a chance to shoot it with a camera it ducked under and only reappeared far out. Those who waited for the later launches had a better opportunity for taking pictures as they went across to the other side of the bay.

The steamer left Schoonhoven, which is the correct name for Recherche Bay as the French somewhat audaciously called it after 1838, and arrived at Advent Point at eleven P. M., but such a gale was blowing down Advent Valley that the captain dared not risk anchoring in the bay. The year before similar conditions had prevailed; the anchors had dragged in the soft muddy bottom, and the ship narrowly escaped going on the rocks. Consequently they turned away and proceeded to Sassen Bay or Sassede Bay which is the great Eastern extention of Ice Fjord. That was a great disappointment to Mr. Longyear who had taken the expensive trip for no other purpose than to examine the coal-prospects at Advent Bay. Though the weather was very cold he got up, and, partially dressing, went on deck. The ship was in a small bay known as Bjona Havn, where the rock formation seemed to be identical with the coal formation on the south side of the Ice Fjord. He snapped his kodak at the shore and noticed that the officers were heaving the lead, apparently with the intention of finding a place to anchor, but the water was exceedingly deep.

At Anchor in Advent Bay. When he got up in the morning he was about to interview the captain and ask him for a launch in which to run over to Advent Bay; but, the wind having died down in the night, the *Auguste-Victoria* had turned about and was actually anchored in Advent Bay. An extract from Mr. Longyear's diary gives a vivid account of his experiences in investigating the coal-formations. Jeldness was late to breakfast and promised to meet Mr. Longyear and his cousin later on shore. The diary says:—

"We struck out for a hill that looked to be about twenty minutes' walk away. We walked and climbed for more than an hour before we reached it. The hills looked to me to be about five or six hundred feet, but the barometer we had with us showed a height of more than eight hundred feet when we were about half way up. We did not go to the top.

"On the way we saw a gray fox not far off, but too far to photograph. I watched him for some time with the field glass. He would run away a short distance, stop, and turn around to look at us. A lot of birds were around him making a great fuss, scolding and squalling in great excitement. I don't know whether or not he would have recovered from his shyness enough to let us photograph him if we had been alone, but he saw other people passing us lower down and he seemed to think it wiser to leave. He disappeared very quickly when he really 'lit out.' We also saw many reindeer tracks and birds; the most interesting of which to me was a ptarmigan or Arctic grouse. He sat on the crest of a snow bank at the edge of a ravine, evidently watching the wolf, and allowed me to get almost, but not quite, near enough to photograph him.

"We saw a place where some one had dug coal out of the side of the hill, but the diggings were covered and filled with shingle which covers the hills here everywhere except the cliffs. We returned to lunch at about two o'clock, not having seen Jeldness. He did not show up at luncheon, and about four o'clock we started out again and climbed a hill that looked easier. We went up about eight hundred feet and found more coal-diggings filled with ice, shingle, etc. As it was approach-

ing dinner-time we returned to the ship. In places the hill was very steep and covered with snow and ice. I slid down one place about fifty feet in three seconds. I sat down to do it and found the ice quite cool!

Jeldness' Prospecting. "We found Jeldness at the ship. He had come in about six o'clock, having had no luncheon and having tramped miles over and around the hills. He was so wet and muddy that the officers were not at first willing to allow him to board the ship and asked him who he was! When they found that he was a passenger they laughed and it was all right. He reported seeing much coal in the shingle along the side of the hill west of the west outcrop and that probably the coal-seam stretched for many miles on the north side of Advent Bay—at least as far as Sassen Bay.

"Reindeer were seen from the deck of the steamer; a hunter went out and killed two. The hunters also brought in ducks and many useless gulls. It is not easy to see how they get satisfaction in killing such trusting things as these birds are. One could almost kill them with a club."

Mr. Longyear felt satisfied that Advent Bay was a comparatively warm locality. The ice and snow on the surrounding hills seemed much less abundant than in other places. As they sailed up the Ice Fjord they could see miles of high mountains ice-capped and covered with glaciers. He thought it a forbidding landscape at least from an agricultural standpoint!

A Hasty Survey Accomplished. During the thirty-six hours of their stay at Advent Bay they managed to visit the various points where coal was indicated on the Norwegian explorers' maps.* Some of them had been scarcely touched; in others, considerable excavations had been made, but wherever there were dumps the pits were caved in and were covered with ice and débris. They were able, however, to take samples, and to make such rough calculations and surveys as the limited time permitted.

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*A quite full list of maps is contained in the *Henvisninger* or Authorities printed as an appendix to Gunnar Isachsen's "Spitsbergen-Norge." (Kristiania 1921.)

W. D. MUNROE AT EXPLORING PIT SHOWING COAL

WILLIAM D. MUNROE

5. AT VARANGERFJORD

The ship arrived at Digermulen July 15 about half-after-eight in the morning, and Mr. Longyear and his companions, taking all their baggage, which was passed without examination by the customs officer on board, went ashore. They found a crowd of people attracted by the report that the King of Sweden and the German Kaiser were to put in there on that day. All kinds of craft were arriving from all directions, and it was said that the little fishing-port had never before in its history seen so many visitors. It was wretched weather, cloudy, wet, and cold. The landing-stage became so overcrowded that it broke down, dumping a lot of sightseers into the icy water, but fortunately no one was seriously injured. Mr. Longyear's diary says:—

"We managed to secure a luncheon of boiled eggs, bread, butter, cheese and coffee. I was much interested in watching the people in the crowd. There were some fine-looking old men and some handsome young folks, but generally the records of the hard lives they lead were written all over them. It was very interesting to see how easily they handled themselves in rowboats. Girls, boys, old men, old women, walked in and over the bobbing boats, standing on the seats, climbing over and passing one another, all standing at the same time without the slightest difficulty and no one ever falling overboard. They grow up in their boats, and are as much at home in them as on land."

The Kaiser was detained at Bergen by the bad weather, and King Oscar's yacht, hardly visible through the fog, passed by about a mile from the shore and then, turning, passed by again, and that was all the reward the poor people had for waiting so long in the rain and the cold.

The Trip to Svolvaer. In the middle of the afternoon, the mail steamer, *Røst,* came in and Mr. Longyear and his friends immediately boarded it, going out to it in a rowboat high at both ends. The *Røst* was about one hundred feet long and twenty or twenty-five feet wide, and was packed with passengers. All the men and such of the women as could not

get into the cabin were on deck, only a part of which was covered, so they all tried to find shelter on the leeward side of the ship, thus giving it a decided "list" and tipping the awning up so that the cold rain drove in on them.

The journey to Svolvaer, the so-called capital of the Lofoten Islands, lasted only about an hour, but their discomforts were not at an end even then, for the hotel on the pier was full, and it was raining hard. Under the guidance of an old man they went to another hotel, and there also no rooms were vacant, but they found very narrow quarters at a house near by. Mr. Longyear's bed looked like a big crib, and when he straightened out with his feet against the footboard his head was against the wall. The old woman who afforded them this shelter asked if the Americans could speak Norsk, and when Jeldness answered No, exclaimed "Poor things!" They got their meals at the nearby hotel, and had for supper tea, bread, butter, cheese, and eight different kinds of fish-omelet, cold, dried and pickled. For breakfast they had specially prepared oatmeal, boiled eggs, bread, butter, cheese, dried meats, and pickled fish.

On the Lofoten Islands. After breakfast they sallied forth to see the town, which is very picturesque, with many small islands and rugged mountainous rocks rising to a height of some two thousand feet behind it toward the ocean. Many waterfalls came tumbling down apparently from the clouds. They found the Lofoten children very well-mannered: the boys took off their hats and the girls, even the little tots of three and four years old, curtsied to them as they passed them in the streets. The waiters at the hotel were more primitive. For each new course at dinner the knives and forks were carefully wiped on the same towel behind each guest. They were given napkins but the napkins had been already used.

The steamboat, *Haakon Adelstein,* came in that evening and they immediately went aboard, but had some difficulty in securing accommodations, as nearly all the berths were taken. Finally the clerk gave Mr. Longyear and his cousin a stateroom, and Jeldness slept in an upper berth. They reached

Tromsø at noon. As Mr. Longyear was wearing his *Auguste-Victoria* cap all the people took him for some kind of an officer and "fell down and worshipped" him, though they were somewhat puzzled by his big horsehide shoes which seemed incongruous.

They left Tromsø at one in the afternoon and soon passed the steamship which had King Oscar on board; the King waved his handkerchief in acknowledgment of the display of bunting and other greetings. The sun bored through the heavy clouds and brought out the beautiful scenery between Tromsø and Hammerfest: the lofty snow-covered peaks abounding in glaciers, and the vivid green fields near the water's edge. They did not land at Hammerfest but immediately boarded the old steamer *Kong Halfdan* which was making her last trip to Vadsø before going into dry dock. This ship was also crowded, and the best the old steward could do was to put the three men into a single room about six feet square. The next morning they were passing Nordkyn, the most northerly point on the continent of Europe. They could see North Cape about forty miles away toward the west.

Shortly before noon of July 18 they stopped at the fishing village of Mehavn where the fishermen had recently combined together and destroyed the whole whale-boiling plant, on the ground that the destruction of the whales had ruined the fishing industry. They claimed that a fish, like the swordfish, a deadly enemy of the hair-seal always accompanies the whales; when the whales disappear this fish also withdraws, leaving the seals full power to devastate the fishing grounds, and driving the fish away into deep water. The fishermen had appealed to the Government to stop the whale killing but, when nothing was done about it, they took the matter into their own hands and wrecked the works. It was said that this was the first time such a thing had happened in Norway in time of peace.*

When the *Kong Halfdan* reached the harbor men were at work restoring the boiling-works, but the carcasses of eight

* See p. 41.

monstrous whales lay decaying in the "boom" like logs and the stench as the ship passed by within a hundred feet was overpowering. When on departing from Mehavn they passed the headland of Smørbringa their attention was called to an isolated rock called "The Bishop," which looked like a huge statue in robes and miter.

They reached Vardø about ten o'clock at night and were immediately transferred by boat to a still smaller steamer, the *Harstad,* which was crowded with Finns, Lapps, and a few Norwegians. There was no time to land but they could see and smell the stacks of fish-heads, ready to be shipped to the guano-factories. The main occupation of this prosperous little city of two thousand inhabitants is fishing and the harbor was full of craft of all kinds. The vessel had in its small triangular cabin only four lower and four upper berths, and as the cabin was situated at the stern the shaft under the floor rumbled and grumbled all night. The lower berths were occupied by women and girls, and the three men and a stranger climbed into the upper ones and slept in their clothes.

Approaching Varangerfjord. When Mr. Longyear went on deck about four in the morning the sun was up and shining. The vessel was just entering the Barfjord, a branch of the great Varangerfjord at the extreme northeastern corner of Norway. The shores were from one to five hundred feet high, rocky and precipitous. They saw a whale, a porpoise, and a seal in the fjord, and reindeer on the banks. About ten o'clock they reached Kirkenaes, which with its church, store, postoffice, telephone and telegraph station, and four or five houses, is prettily situated on a point of land between the Langfjord and the Pasvik Elv (River), and separated by an island from the Varangerfjord.

From Kirkenaes they were driven in an odd little four-wheeled wagon drawn by one horse seven miles to Sandnaes, where they found their luggage which had been forwarded by rowboat. They themselves could not go by water all the way owing to a narrow place in the Langfjord through which the tide rushes with a violent current. When they rejoined their

boatman he had secured a larger boat of the genuine Norsk type, and had three women to help him. Two of them pulled at one oar, the other pushed one; Jeldness and Munroe had an oar apiece; the boatman and Mr. Longyear manipulated the antiquated steering-gear which consists of a stick eighteen inches long fastened at right angles to the rudder and hinged to a pole extending to the middle of the boat so that one may sit in any part of the after-half of the boat and steer it. It rained all the afternoon, and also after they reached their destination, a little place called Bratli at the head of the fjord.

A Camp in Northern Norway. Their camp consisted of a new, unfinished but habitable, log-house about one hundred feet above the water's edge, and adjoining a three-acre farm on which were several sod-roofed buildings belonging to a Finn and his family. They got milk from the farm, and, with hams and other food which they brought with them, they improvised an appetizing meal. In this place which Munroe and Jeldness had rented from a fisherman they spent a fortnight while they were examining the iron-formations in the vicinity. They baked bread with a kettle and a rude stove provided with a large pot-hole. This could be reduced to any size down to four inches by iron rings. The cold weather and the storm which reminded them of a heavy November northeaster in Michigan, effectually drove away the clouds of mosquitoes which had accompanied them up the fjord.

When it cleared on the third day at noon they started out on their exploring expedition. Mr. Longyear's diary says:—

An Exploring Expedition. "The ground was saturated with water and it was like walking on wet sponges. Mosses and lichens grow here almost everywhere, the white reindeer-moss being as common as any. That is, it was everywhere. I was surprised to recognize it as a moss that grows in the rocks in the Upper Peninsula of Michigan.

"We walked half a mile to Ørne Vand (Eagle Lake) where we found several boats, one of which we took and rowed across the lake about a mile. We tramped around over the hills, rocks, moss, etc., for two or three hours

and then returned to camp. At one place we could look across the line and see the hills on the northwest corner of Russia. They looked just like those around us in the northeast corner of Norway! The scenery here is very like that in the rocky parts of the Lake Superior region. Scattering, stunted pines and birches, fir-trees, moss-covered, rounded rocky hills, etc. Every hollow in the rocks here is filled with mossy bog which just now is very wet. The recent heavy rains have saturated everything but the most solid rocks."

They saw many flocks of ptarmigan, and Mr. Longyear photographed a young bird at a distance of about six feet, but he says the ptarmigan did not enjoy it for he peeped dismally the while. They noticed that the ground seemed to have been dug over recently, but as there could be no incentive to do such work they wondered at it until finally they discovered that the mysterious agriculturist was Jack Frost who heaved and tore the moss apart, and pushed up quantities of mud and stones through the openings, which might be from a few inches to several feet across. In one place they saw indications that a wolf had pursued and killed a reindeer. The track of the hunt was marked by tufts of hair and gory hide.

The fields were infested by a big field or wood mouse, about half as large as a rat: these pests appear from time to time in millions and destroy all the crops.

On July 23 they went to Harefossen, or Rabbit Falls, which are at the foot of a lake on the Pasvig River which there forms the boundary between Norway and Russia and is wide and deep with tremendous velocity. The water rushes through a notch in a ledge of rock. It seemed to be about ten feet deep and very clear. The upper part of the fifteen-foot fall is perfectly smooth—an inclined plane rushing by so fast as to make one dizzy to look at it. The lower part is broken into foam by rocks, and clouds of foam and spray fly high into the air. Engineers estimated that forty thousand horse power was running to waste there, but Mr. Longyear thought this an extravagant calculation. The whole country round about was dotted with lakes and ponds and bogs. The rock-formation

was mainly granitic. The next day, which was bright and sunny without wind, they set out to visit the camp of Herre Henrik Lund, agent for the great speculator, Christian Anker. He was then living in a log hut he had built on the shore of Bjørnevand (Bear Lake).

Mr. Longyear's diary says:—

"We rowed down Langfjord about a mile and a half to the outlet of Björnevand where it reaches the fjord in a pretty fall of about one hundred feet in height. Then up the trail a mile and a half to the lake, making a rise of three hundred feet. Then by boat again about a mile and a half or two miles to Lund's camp. Lund is an engineer who is doing a lot of surveying in this region. He is a slight man, thirty-five or forty years old, and a character. He saw us coming and came down barefooted from his camp about one hundred feet above the water to meet us. He was very cordial, and we took lunch with him. He told us that he had been off, alone, all the morning, using a magnetometer; that he found it hot, so he took off his clothes and went some miles, 'pure naked' (He talks English). He said the mosquitoes were not very bad. We walked over some hills near his camp and returned home."

The Finns that owned the three-acre farm had an isolated bath house about a hundred yards from their dwelling. They would build a fire in it and carry in a big tub of water. Then into the tub they threw heated stones so as to make steam. One evening Mr. Longyear saw a naked man going from the dwelling to the bath house. Pretty soon he was followed by another. After the men had bathed the woman of the house had her turn, but she wore clothes. Nothing else was needed to signify that it was Saturday evening. These Finns had a herd of twenty-four reindeer, which they use for hauling wood on sledges and other draft work. The young man of the household who could talk Norsk told Jeldness that recently while gathering moss for their next winter's food for the herd he discovered that wolves had killed two of them. Wolves are very destructive in all that region but the natives do nothing to cope with them. Neither do they attempt to drain their land

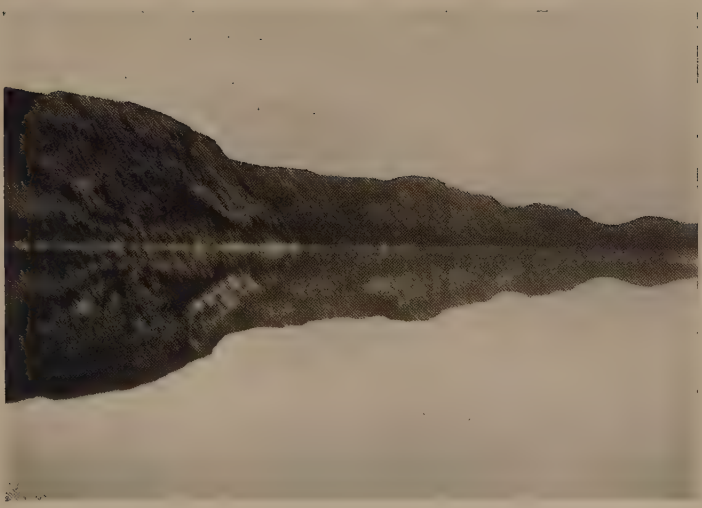
though a few ditches which a pair of men could dig in a week would keep their fields in good condition. They are well aware of this, but are contented to wade through the mud.

On July 28 after Mr. Longyear and Jeldness had returned from a six hours' tramp to the top of the Bjørnefjeld, or Bear Mountain, they received a courtesy-call from the landsman or chief-officer of the district. He knew no English and Jeldness had to act as interpreter, but the conversation was limited to compliments. Meantime Munroe was making careful analyses of the iron ore in the vicinity. He established in a small tent next the house at Bratli what he called the most northerly laboratory in the world. He used packing boxes for shelves and efficiently improvised other conveniences.

Shooting the Rapids. The next day they packed up and the Finn family moved their luggage down to the landing, using a reindeer sled which slid down over the steep, moss-covered rocks. Then at one o'clock they departed in a big row-boat with their traps piled in the middle while they perched on top. The two men did the rowing; one in the bow pulled while the other in the stern pushed the oars. Only twice in four hours did they change places, though they rested for an hour at the "Strøm," as a place is called where a glacial moraine of large rounded boulders had almost filled the Langfjord for a distance of several hundred feet, leaving a narrow channel only about two feet deep in the shallowest places. As the fjord on each side of this obstruction is half a mile wide with water from thirty to one hundred feet deep, there is a violent current, except at the slack of ebb and flood tide, running in and out of the fjord.

When they arrived there the tide was running out with such force that it was deemed dangerous to pass through with their heavily loaded boat. The waves were more than six feet high in the middle of the stream and there seemed to be several feet of fall, the tide rising and falling three feet above the "Strøm" and from five to seven feet below it.

The tide had washed away all the gravel from the moraine, leaving nothing but boulders averaging about a foot in



ON LANG FJORD, VARANGER

UP LANG FJORD, VARANGER. JELDNESS AND MUNROE

diameter, and on them grow quantities of dense seaweed which is the habitat of a small blue-shelled mussel so abundant that they form a considerable part of the obstruction to the channel. While they were waiting for the current to calm down, a Lapp woman ran a light boat down through the swift current. After waiting for an hour or more the men took the boat through and even then the passengers following along on the shore could at times see only their heads above the tops of the waves. After the tide turned they had to row against the current which was aided by a stiff north wind which cut them like needles, the mercury in the Celsius thermometer indicating only 5° above freezing. They found Herre Lund and the boarding-house keeper, Herre Finkenschon, waiting for them on the beach at Kirkenaes, and when they had supper at ten o'clock, while the day was still bright, the family ate with them.

Traveling Third-Class. They went to bed to get warm and were called at two to take the steamer for Vadsø. It was the same little old *Harstad,* and even more crowded than before. The saloon was so malodorous that they stayed on deck with a lot of Lapps, Finns and other passengers. When they came to pay their fare, they found they had been traveling third-class. In the stuffy cabin, as they discovered on landing, were Admiral Hammond, R. N., retired, and Sir William Ffolkes who had been salmon fishing on Pasvig River, and had a very big fish crated as ocular proof of their prowess.

At Vadsø. Vadsø harbor was crowded with Russian schooners which were there to buy fish since the Russians are not permitted to fish in Norwegian waters. The steamboat *Orion* on which they were to sail to Hammerfest was anchored about a mile away but was not to sail until seven o'clock in the evening, so they had all day to devote to the town, and they learned much about the fishing industry in Norway. Mr. Longyear's diary says:—

The Fishing Industry. "We put in time looking at and smelling the festoons of drying fish-heads which are everywhere very much in evidence both to eyes and nose. We talked with one girl on the beach, who was stringing the heads.

She told us that the fishermen gave her brother the heads but he was too lazy to string them, so she did it—a dozen or twenty to a string, so they will hang over the poles of the drying-frames. The frames are made of poles laid horizontally on trestles seven or eight feet high. These frames cover acres and acres of ground near the fishing-stations. Fish, split to within an inch of the tails, and fish-heads on strings, are hung over the poles and air-dried for market. The girl told us that they get (for the dried fish-heads) four *ører* ($0.0108 United States money) per kilo from the guano factories. As it would probably take twenty-five or thirty heads to make a kilo we thought we should rather make our money mining iron ore! The amount of labor these people here are willing to do for very little money is astonishing.

A Picturesque Scene. "After 'doing' the town we sat for an hour and more on the pier, a stone mole built out into the harbor, the sides and outer end constructed of blocks of stone laid in rough stairways, so that fishboats can land anywhere. It is a center of activity, and we were entertained watching the picturesque and often very dirty groups of Lapp, Finn and Norwegian fishermen. The boats, each about thirty to forty feet long, open, each with one short mast, spars, etc., were constantly arriving and departing."

They were fortunate enough to fall in with a friend of Jeldness's, Bergmester Bashker, who had charge of all the mining affairs of Finnmarken, and he was on his way to look at a lot of new claims near Kirkenaes. They found him well-informed and intelligent.

At Hammerfest. They reached Hammerfest on July 31 at six o'clock and remained on board until the arrival of the Trondhjem boat at half after eleven. Mr. Longyear's diary describes the transfer:—"There seems to be nothing to prevent steamers from lying side by side in the harbor, and allowing passengers to step from one to the other and pass the baggage over the rails; but transfers were all made in rowboats. Sometimes heavy baggage is passed in and out from doors in the sides of the steamers, but generally it is carried up and

down the jiggling stairway that is suspended on the side of the ship. I watched passengers, trunks, bags, boxes, bundles, baby-wagons, bicycles, etc., etc., worked up and down the stairways, and wondered why they did it that way. It must be for the benefit of the *Flodmänd* or boatmen who do the transferring.

The Box of Specimens. "We have an innocent-looking box, quite small, in our dunnage, but it is filled with geological specimens. It looks as if it might weigh twenty or thirty pounds but it will probably tip the scales at one hundred and fifty. It is amusing to watch the faces of those who catch hold of one of the rope handles with one hand and try to swing it lightly. The expression of surprise and indignation that it has caused is worth seeing. One old Flodmand balked on taking it up the stairs, and a donkey-engine and a derrick finally hoisted all our heavy baggage. We wondered why they allow the passengers to carry any of their trunks up the wobbly stair ladders."

The Journey South. They reached Trondhjem about four o'clock in the afternoon of August 3 and the only train for the south left early in the evening; but they failed to make it and had to wait for twenty-four hours. It runs over a narrow-gauge track, following the deep valleys of the mountain streams through scenery which would be grand and picturesque by daylight and in fair weather. At Hamar they changed to the Kristiania train which on the standard wide-gauge road skirts Lake Mjøsen, the largest body of fresh water in Norway, and gives charming views of rich farming country, well cultivated. They reached the capital about noon and it was still raining.

Their investigations of the iron region around Bratli had not proved very satisfactory. The largest exposure of iron ore in the district was in the form of a large V about six hundred feet high, a mile and a half in length and several feet wide. But the ore averaged only forty-two per cent iron, was finely laminated, and very hard. They estimated that in order to concentrate it, crushing and passing it through a sixty or even

a hundred mesh sieve would be necessary. This would make the product into fine iron sand, and briquetting would be required before it could be worked in a furnace; unfortunately briquetting on a large scale had never been done on a satisfactory commercial basis. Mr. Longyear was certain that there were billions of tons of better ore for concentrating purposes within thirty miles of his office in Marquette, Michigan.

A Rival to Anker. While at Bratli, just before they left, they received a letter from one claiming to be a Captain of the Royal Norwegian Army, dated July 26 at Nyborg in the province of Vadsø. He stated that he was interested in some of the iron claims situated on the Pasvik Peninsula, on the South Varanger Fjord (Syd-Varangerfjord) and was desirous of selling them. He said:—

"As you are down there probably to see Mr. Anker's claims, this gentleman and his agents or engineers of course will not tell you that there are other claims, just as rich, and some of them, for all I know, even richer than Mr. Anker's. This fact, of course, he does not like to come to your notice, firstly because the value of his claims will be less, as there may be started a competing company at any time; secondly, because he has done his very best to get land and necessary franchises of different kinds (the Harefoss, for instance)—without success, the Government being well aware that there are many other claims besides. Mr. Anker came very near to getting all he wanted last fall, but, too, we heard of it, wrote to the Government and had it stopped effectually and for good. Other parties having got claims and good claims, as well as a sufficient number, the Government never will and never can give the land and franchises to Mr. Anker. He had to buy one of us out last year (41 or 42 claims to the north of Bjørnevand) because these claims shut him off from the sea, just as ours now do. We have at present about fifty claims between Mr. A.'s and the fjord, most all of them being nearer to the coast than Anker's. The rest of our claims (numbering altogether about one hundred and twenty-five extend from Brandfjeld in a south and southeast direction, running east of Langvand and

SHOOTING THE "STROM," LANG FJORD

IN VADSØ HARBOR

Fiskevand—one continuous mass of ore—forty, fifty, sixty per cent. Mr. Anker's prospectors did not take them last year, believing it was Russian territory.

"What I want to impress upon you is this: Whoever buys the iron claims in South Varanger must buy them *all*, as the Government never will and never can give land and franchises, etc., to a syndicate of foreigners when natives have got so many and so good claims as we have, which was clearly proven last year, when we had it all stopped. But the man who gets it all will get all he asks and reign supreme—being native or foreigner—because the Government would like to see a great enterprise started in these parts.

"My partners and myself do not want millions—we are satisfied with a much lower price.

"I should very much like to see you and have a talk about it, and could take along some samples. But I have not got much time, as I am at present drilling the soldiers here at Nyborg. The only leave I can get is from Saturday at 2 P. M. to Monday morning at 6. And my partner can not speak one word of English. If you should like to have a conference, please drop me a line or wire me. There is a petrol motor boat (with a cabin) at Vadsø—telegraphic address—'Motor, Vadsø,' that can take any of us across in a few hours."

Apparently this letter was received too late to arrange a meeting but the information which it contained must have had some influence on the decision to which they arrived.

Discussions With Anker. On August 6 Mr. Longyear and his friends spent some hours with Herre Christian Anker, and discussed with him the proposition which he had made; but conversation was rendered excessively difficult by reason of his almost total deafness. He was polite and genial, and invited them to take supper with him at Holmenkollen, a hotel built in the finest Norwegian style with much beautiful wood-carving, situated high up on a hill commanding a magnificent view over the city and the fjord. Mr. Longyear gave Herre Anker his impressions of the iron properties, and told him that he was not very favorably disposed to do anything with

them; but, nevertheless agreed that if he would make a satisfactory proposition he would go ahead and seriously investigate the various briquetting processes. Anker, who was an old man, and had never seen his iron lands but had an exaggerated notion of their value, having evidently been deceived by those sent to report on them, would not come to terms, and evidently thought the Americans did not know what they were talking about. However, he consented to extend the option to May 1, 1904, with the water power on the Pasvik as an additional concession to them.

Several years later a company composed of Swedes and Norwegians borrowed ten million marks from German bankers and established a plant to develop the Anker properties, making briquettes under the Gröndahl system, but as the wear and tear of this process is exceedingly severe on the machinery in crushing the obdurate ore, and on the furnaces requiring alternate heating and cooling, it was predicted that it could not become commercially successful.

Some months after Mr. Longyear and his friends had returned to America, Mr. Jeldness received a letter from one of those interested with Herre Anker, a few extracts from which shed an interesting light on politics in Norway. He wrote:—

Politics in Norway. "I have seen a letter from your principals making or declaring themselves ready to make a substantial offer as soon as Anker should come to terms with our Government.

"On this point I have something to say. Our late liberal Government (now succeeded by a coalition one) desired to cater to the prejudices of our lower classes—those that are instinctively opposed to capital and its interests, to play to the gallery, to catch votes for the impending election, as a popular Democratic Government, with the catchwords, 'Norway for the Norwegians,' 'Rather lie fallow than sell to foreigners' and the like, and making all sorts of obstacles."

Jealousy of Capital. He went on to describe a controversy between Anker, who had the right on his side, though his arguments were delivered in a haughty, superior way, and

a professor of mineralogy, who had the advantage in wit if not in his facts as was shown by citations from one of his own books. The impression apparently gained ground especially "among the ordinary casual daily paper readers" that Anker had "laid his heavy capitalist hand on the soil, to the shutting out of honest, poorer men." He ended with these words:

"The present Government is far more tractable and admits the necessity of foreign capital, when national capital is not available; but even this one will probably wish to make sure that whatever company is formed will ultimately be Norwegian, so as to shut out the possibility of the property's becoming Russian. I myself think that Anker should have tried that from the first—called you and your people down to Fredrikshald, preliminarily establishing a joint stock company with Norwegian straw men and American capital, then offered a proposal to the Government to buy the whole thing out and thus have got it cheaper, tickled the chauvinist vanity, and have had the same result."

The writer had roseate hopes of getting into the deal himself, for he added the hint: "If Anker sells to your principals you may have an employment to offer a sensible skipper and an honest one."

Failure of the Negotiations. Anker's expectations of realizing a great price for his properties and his reluctance to make favorable terms, coupled with the "chauvinist" attitude of the Norwegian Government, the prospect that exploitation of the iron mines would involve far greater expense than the early reports of their availability, and the intrinsic richness of the ore seemed to promise, effectually put a damper on the enthusiasm of the American investors. Their venture was a flash in the pan but the spark kindled a coal fire which had far-reaching consequences.

6. SPITSBERGEN PLANS CONSIDERED

When Munroe returned to America, he went to the Michigan School of Mines, where he had been a student, and, assisted

by Professor Koenig of the chemical department, made analyses of the samples of coal which had been brought from Spitsbergen. The analyses were so satisfactory that Mr. Longyear and his associate, Mr. Frederick Ayer, authorized him to enter into negotiations with the Trondhjem-Spitsbergen Kulkompagni for the purpose of taking over their claims to the lands where the coal was situated on Spitsbergen.

This Company had in the meantime published in very quaint English a quarto pamphlet entitled "Vaste Deposits of Coals on the Spitzberg Island" and containing "splendid analysis" of the coal made by Dr. P. L. A. Schulerud, "professor at the tecnical school," and a forecast of "Mining Ingener" that the mines would provide about two hundred and thirty-nine, possibly four hundred and sixty, millions of tons.

Any English reader noticing that the booklet was issued from the "Adresseavisens Bog—& Aksidenstrykkeri," might have suspected that the trykkeri was only the Norwegian for bluff. But the report of the mining engineer was certainly interesting reading. One passage, copied verbatim is as follows:—

Description of Advent Bay. "Advent Bay is a very well sheltered harbour far inward in the Icefjord. It is against East, South and Southwest surrounded by very high mountains rising in ledges from the sea. Against West lies a sandbar sheltering the harbour against the westerly winds. The exits of the coal strata pointed out by the original finder are lying on the southern side of this bay in the hight of about one hundred and seventy to one hundred and eighty meters (yards) above the sea.

"The rocks contain argillaceous shists, sandstones, and calcareous sandstones in alternating strata and between these layers of coals, of which there are at least two in different levels but possibly several ones. It is combined with gret difficulties to lay open the strata in any cohessive length in order to make a thorough examination owing to the rock fall which nearly everywhere covers the mountains, and this is frozen immediately you come a little way inside.

"Instead of spending too much work on the rock falls we went during our stay in on the coal strata itself and took out a good parcel from there. In this manner we had opportunity in the short time we had to our disposal to examine pretty closely a couple of places by number 1 Solberg mine and number 2. At the former one the coallayer had a breath of 1.36 meters with the small decline of 4° to southwest. At number 2 it was looking somewhat alike. One layer was likewise observed by number 3 but this was not practically examined. All these places are lying according to the barometer observation about one hundred and seventy meters high, so that the layer by number 3 is lying highest and by number 2 lowest.

Rich Strata of Coal. "This proves accordingly, that all these places are belonging to one and the same widely extended and pretty rich strata of coals. To be sure this is in the slope of the mountains divided by the cannons dug out by the small rivers from the glaciers but under the plateau of the mountains it is certain to build a cohessive plan provided the continuation should not be interrupted by deformities. By O lying about two hundred and twenty-five meters above the sea likewise coal was seen. Perhaps that the excit with the breath of 3 meters found by the original finder this Autumn is lying on the same level as O, but it is, however, on account of the great extent most likely, that the layer found last is quite a new one. This can, however, only be decided by taking exact measures and after thorough examination as before mentioned it is on account of the regularity of the strata building to be believed, that the coallayers will continue very regularly throughout the whole territory, which the company has secured.

Quantity of Product. "The territory comes up to 178.5 kilometers^2 and consequently will a layer of only 1 meter deep give a stock of about two hundred and thirty million tons of coals and even the breath of one and one-third meter found by the Solberg mine must be considered fully workable and the more so the layer of 3 meters breath found by the original finder. One of the professors of the tecnical highscool here has anylized the coals from Advent bay and it proves,

that they nearly may be given character as gas coals. They burn with a long flame and are very easy to lighten. The outturn of cokes is according to Mr. Schulerud 65 0/5, consequently the coals give 35% fugitive parts, of which the half is gas, while the other half consists of ammonical water (3-5 %) and tar. The heat producing power has Mr. Schulerud calculated from the analysis and found like 7311 Kalorier, but the sample being watery, because it was taken from outside frozen strata, the heat producing power is probably higher, and it may certainly be supposed, that 1 kg. coal from Advent bay warms and 112° evaporates 8 kilos water of 0°. However, it is uncertain, if the coals will continue to be of the same quality through the whole. It is oftener f. i. at Newcastle, that it is on one and the same strata as well gas as steamcoals.

Unknown Factors. "It is thus here at Advent bay one or more coalstrata of a good quality and with a probable very wide extension, which certainly will be workable on these northern latitudes. Over the expenses of the working it is not easy to estimate seeing we have to consider unknown factors. It is here specially to take into consideration that contrary to coal mines in civilized lands, that no great capitals are wanted for starting the work, then there is no question neither about expensive securing of ground nor the difficult and costly construction of dear schafts and further no attention to pay to an inhabited surface.

"The transport from the mine alongside the ship will be favourable and specially cheap owing to the ground offers every facility for the construction of a rope line able to convey any quantity. But on the other side it must be taken into consideration, that the working may be difficult and the wages high. It is at the present moment very difficult to make any estimation about the price per ton mined out seeing there is no experience from a trial work on a larger scale and the same is the case with the percentage of saleable coals per yard worked out."

Grönvold's "Estimations." The pamphlet contained also "Railway Director Grönvold's Report and Estimations" as to

the possible expense of installation and operation and the probable profits to be made. How modest the expenses were calculated to be may be gathered from the table appended, in which machinery and engines were reckoned at thirty thousand kroner, the laboring expenses at ten thousand, and the "manager's fee" at six thousand. The total installation amounted to 193,500 kroner and the "Specification of laboring and working Expenses," on a basis of sixty laborers was 240 kroner, which, divided on a production of seventy-five tons a day, made the cost per ton 4.53 kroner and for 100 tons 3.40 kroner.

Olaus Jeldness on his return to Spokane wrote an enthusiastic letter in regard to the Spitsbergen mine on which he had obtained for himself an option, paying for it from the letter of credit given him by Messrs. Ayer and Longyear but suggested that it should be transferred to either of them. In his letter of September 7, 1903, he said:—

Letter from Olaus Jeldness. "If the property is found acceptable to American capital, the consequences will be far reaching, and of a magnitude that we had but a faint idea when we planned the enterprise.

"The great Republic is expanding. We own the Hawaiian Islands and the Philippines. Japan and China is our neighbors, and we are just now disputing with Russia her invasion of Manchuria. The difficulties in the Orient will sooner or later lead to a clash of arms, with the ultimate result that America will dictate to the world, and she will be obeyed.

"It is in this connection that I believe our little enterprise will be of importance and probably render the promoters immortal. We can, for instance, show our country how to attack Russia in the rear by annexing Spitzbergen, and thereby securing an unlimited coal supply and thereby enabling our men of war to reach the White Sea, one of Russia's greatest grain and lumber shipping ports, in thirty hours' sailing.

"Every statesman in Norway and Sweden knows that Russia is waiting for an opportunity to seize an open port on the Atlantic, and they consider it only a question of time till she takes Norway. If our undertaking results in the annexation

of Spitzbergen, Russia's advance on Norway will be blocked, and an untold blessing will thereby be conferred on Scandinavia. All this and much more will surely come about if our plan is carried out, and I will continue to hope that the property proves acceptable."

7. PURCHASE OF THE MINE

It was considered desirable to secure an extension of a year for the option to run and this was readily granted. The Trondhjem-Spitsbergen Kulkompagni had been trying for three years to get three hundred thousand kroner subscribed to its stock, and had succeeded in placing only sixty-six thousand kroner. The option, translated into English ran as follows:—

The Text of the Option. "The Trondhjem-Spitsbergen Coal Company does hereby give to Mr. Olaus Jeldness an option to purchase all their properties at Advent Bay, Spitsbergen, together with all the rights the Company possesses from this date to January 1, 1905, on the following conditions:—

"Said Olaus Jeldness agrees to organize a Company with a stock-capitalization of Kr. 350,000—three hundred and fifty thousand Kroner—or its equivalent, if expressed in some other country's coin, or unit of value. It is further agreed that in consideration for said rights the Trondhjem-Spitsbergen Coal Co. shall receive Kr. 50,000—fifty thousand Kroner—in fully paid shares from said capitalization, together with Kr. 10,000—ten thousand Kroner—in cash if this agreement is carried out. Said Kr. 10,000 is to cover expenses already incurred, and shall be paid on January 1, 1905, if the property rights are then turned over to the said Olaus Jeldness or his Company.

"During the year 1904 the said Olaus Jeldness or his representatives shall have the exclusive right to take possession of the property, to dig, mine, build, and also to use all that belong to the Company and which is now on the property, and all the coal which is thereby produced shall belong to Olaus Jeldness or his representatives, but all buildings and other improvements which Jeldness may have effected on the property shall

belong to the Trondhjem-Spitsbergen Coal Company, if said Jeldness fails to take over the property and purchase it according to this agreement.

"For the purpose of describing and identifying the property covered by this option a full description with map is herewith attached and included in said option and becomes a part of same.

"The said Olaus Jeldness shall, in full consideration for this option, pay to the Trondhjem-Spitsbergen Coal Company the sume of one hundred Kroner."

The document was signed by Fr. Bohne, the actual attorney for the Company under date of January 21, 1904.

Right of Possession. The question arose as to the right of the Trondhjem-Spitsbergen Kulkompagni to take possession of territory in a country which belonged to no recognized Government, and in response to a letter from Jeldness Herre Bohne wrote on January 21, 1904:—

"In April, 1900, the Department at Kristiania, i.e., the Norwegian Government, was advised by us that we intended to visit Spitsbergen for the purpose of taking possession of the coal-beds located at Advent Bay, and asked for information on what conditions this could be accomplished, and what rules and regulations had to be complied with in connection with the undertaking. The reply was as follows: 'Spitsbergen is a "No Man's Land" and must not be taken possession of in the name of the Norwegian Government.'

Rules of Procedure. "They also suggested that this could not be done either in the name of any other Government, but only as private property could it be located by any one; and in order to have proof the following rules must be followed: The land claimed must be marked off and mapped on the ground. Complete description and map, showing and stating surface area, should be sent to the Department of the Interior at Kristiania, where it will be entered on the books as legal property.

"According to Norwegian law no citizen of that country can thereafter alter the location or question the ownership.

In case an alien should appear and question the ownership, then the Norwegian Government would protect its citizens. The Government, however, states that there is an unwritten law existing among all civilized nations that private property is everywhere respected. Even the Russians comply with these regulations, as has been proved when Lerner, the German explorer, attempted to annex Bear Island a few years ago. Mr. Lerner personally told me on his visit here that Russia protested against his attempt to take possession of the island in the name of Germany, but acknowledged it as Lerner's, or his Company's private property.

Mapping of the Property. "After having received said instructions, an expedition was fitted out with posts, wires, iron rods, signboards, etc., and left for the North, and reached its destination, June 11, 1900. The property was marked and mapped, and the first prospecting was done, and six hundred hectoliters of coal was brought back. On the return of the expedition in the summer of 1900 a description with map was sent to the Department in Kristiania. In the summer of 1901 another expedition was sent, and was accompanied by the manager of the Rórass Copper mines, Mr. Goetz, mining engineer, and also by the manager of the Ofot Railroad Engineer, Grönvold, as leaders. Again the property was mapped by Grönvold, and a supplementary description was sent to the department.

"All the correspondence with the Department was conducted for us by a reputable firm of local lawyers and therefore all the legal forms have been complied with. . . .

Magnitude of the Mine. "The property is of such magnitude, and the coal-veins are so thick, that it will not be exhausted for hundreds of years. Another point in our favor is that Advent Bay is the only natural harbor in Spitsbergen where ships can be safe close to the shore. When our expedition was up there the first Bergen expedition appeared and was shown where our property was situated, and then departed for the north side of Icefjord and located there. The Bergen Company is not so fortunately situated. Professor

Hasting, the leader of the Bergen Company's expedition, was here yesterday, and in conversation with me he admitted that their property was located on the north side of Icefjord, north of Advent River. He also visited the Department in Kristiania, and found the facts in connection with our property as therein stated. He admitted that his Company was at a disadvantage, as it will cost hundreds of thousands of dollars to construct a harbor on the north side of the bay on their property.

"The option which is herewith enclosed is in every particular written according to your own suggestion, except that we ask Kr. 10,000 if, after your trial-work, you conclude to take over the property. The fact is we are in need of that amount in cash: we must pay some debts and must meet some additional expenses. We also feel that if a few American citizens become interested in the enterprise after trial-work, and find the coal in unlimited quantities and of the very best quality, which we believe with absolute certainty, we are sure they will consider the ten thousand Kroner of very trifling consequence.

Influential Stockholders. "We also believe that the present owners will be able to lend some support to the new company, as we have several men of influence among us: for example, the First Manager for the Nordenfjelske Steamship Company with twenty large steamships on the coast of Norway; also the Manager of the Government Railways as well as the Manager of the Rórass Copper mines and works, which are the largest mining enterprise in Norway.

"The conditions set forth in this option you will now please consider as final, and I ask you to be kind enough to answer by cable as we must learn your decision as soon as possible, for if you reject our offer, we wish to negotiate with others that are after us. We are anxious to have our work started this summer, and I prefer you, as you have shown interest in the enterprise which will surely bring the great material reward you deserve because of the great sympathy which through this you have shown to your native land.

"In conclusion, I take the liberty of suggesting that if the new Company is organized, when it comes to framing the by-laws, in regard to the right of voting, we, as the smaller shareholders, be considered within reason, so that our influence can be felt; otherwise one or two of the larger stockholders may decide the fate of the company regardless of our counsel and judgment."

A False Rumor. A few months before this correspondence was exchanged a news-item was printed in the "Engineering and Mining Journal" of New York to the effect that the Norwegian Government had sent an expedition to Spitsbergen to investigate the value of the coal-deposits of that island, and that the commission had returned with such glowing accounts of their excellence that it was proposed to begin operations the following summer. This was evidently due to some misunderstanding, for the Government of no country would have been allowed to take any such action. But the rumor showed that the eyes of enterprise were turning in the direction of Spitsbergen, and that quick action was needed to forestall anticipation by other speculators.

In Norway keen interest was aroused by the report of the wealth in minerals in the bleak Northeast. A letter from Narvik which appeared in November, 1903, in a Norwegian newspaper under the title "Jernindustrien i Nordland" claimed that the mines of Karunavara and Luosavara were shipping about a million tons of iron ore a year, the ore producing sixty-five per cent of metal but running high in fosforus. The cost of placing the ore at the docks at Narvik was reckoned at five and a half kroner a ton, and it was argued that since the experience of Germany and France showed that it was more economical to establish foundries near the iron mines and import coal or coke, rather than to transport the ore to the vicinity of coal mines, there seemed to be no reason why a successful foundry should not be located at Ofoten. One significant sentence read: "To establish an iron industry in the Nordland on charcoal (Trækul) or Duck Island coal (Andøkul) is impracticable. We are consequently obliged to

import coal or coke from England—unless it should be possible to use Norwegian peat for the purpose."

The last two paragraphs gave a hopeful prediction as to the future of the iron industry in Norway:—

The Rich Nordland. "An iron foundry at Ofoten may be the first step toward the establishment of this industry in our country. Later there will be possibilities of foundries farther north. We must not fail to realize that Norway is to be a mining land. It has every natural facility for that. Bear in mind that even at the present time the mining-center of the country lies in Northern Norway and that many thousands of miners are engaged in this industry.

"The Nordland is in reality the richest part of the country, and it is our duty to do something. Professional men abroad have their eyes open to future developments in mining in regions north of Dover. This fact calls upon us Norwegians to rub the sleep out of our eyes, and to steal a march upon the foreigners. But it must be done quickly or it will be too late."

A Fake Cablegram. As a feather to indicate in what direction the wind was blowing it may be worth while to mention here that the New York "American," with characteristically fantastic disregard to the truth, published in its issue of June 8 a long cablegram purporting to come from Stockholm, to the effect that the United States Steel Corporation was negotiating to purchase for fifty million dollars the iron mines in Lapland, "said to be the largest and richest iron mining tract in the world." The article stated that "more than a year ago President Broms (of the Gellivaare, Luossavaare and Kurunnavaare Malinfæt Company) and President Schwab had a conference regarding the sale of the mines, with the result that shortly afterwards a party of English and American engineering experts, numbering more than twenty, went to the Lapland fields for a thorough examination of the mines and the making of a report on which would be based further negotiations. The Swedish Government, however, interfered, declaring that it could not permit the valuable

property, lying so close to Russia, its old enemy, to pass into the proprietorship of foreigners."

It went on to state that afterwards, when the Swedish Government found itself unable to take over the great property itself, and go to the expense of tunneling the mountains in the cold-swept country and establishing railway connections, they gave Herre Broms official assurance that he might open up negotiation with the American capitalists without risk of interference.*

8. LEGAL RIGHTS

In answer to a later letter from Herre Bohne, dated January 5, 1904, asking for an immediate reply by cable to the question whether Mr. Jeldness's principals were going to accept the terms of the option, and stating that the agent of an English Company was pushing for an opportunity to take over the property, it was decided to make the venture, and in February word was received that the Kulkompagni had agreed to the terms offered. There was still some dubiety as to the legal rights to the lands claimed by the Norwegian Corporation, but all doubts were set at rest, as far as the claims or objections of other nations were concerned, by a letter from the Royal Department of Foreign Affairs, Mercantile, Marine and Manufactures, to the Engineer Herre Georg Fastning of Kristiania, and embodying an official note from the assistant to the Russian Foreign Minister at Petersburg. This note cited a pronouncement delivered July 27, 1871, and containing the following paragraphs:—

Russia's Official Note. "The legal questions which might come up regarding the taking possession of the islands of Spitsbergen, by any of the powers who may be credited with their discovery, or who may have attempted, at different

*James Gayley, Vice President of United States Steel Corporation, told me that there was nothing but "hot air" in this tale and that they had never even considered the Swedish mines, the Corporation having adopted the policy of not making investments outside the United States. The story in the "American" had been "made out of whole cloth."—Memorandum by J. M. L.

times, to found settlements there, are so obscure that it would be difficult to untangle them.

"The Russian Government finds, therefore, to be the most practical generally, not to attempt to settle these questions, but simply to adhere to the conditions as they exist, and which have been recognized by a tacit understanding between the Governments, and which allows this group of islands to be considered without a stated owner, and as approachable by all countries whose subjects may seek to draw benefits from its natural resources.

"This natural condition, it will be noted, will give all equal rights with injury to none; it brings forth between the powers, whose subjects visit these lands, a certain common equality, which the Russian Government can not desire to renounce, without injury to the spirit of National Patriotism. Russian subjects have from time immemorial visited those seas, and have several times, especially at the close of the last century (1800), and in the beginning of this (1900), founded settlements there, and which, in the eyes of the Russian population, justifies the conviction that Russia has a title of right, at least as good as any other nation.

"The Imperial Ministerium does not see any reason for changing a condition which, after several centuries of accepted relationship, as well as the fact that it is in full accord with the plan of colonization, which the Swedish Government wishes to establish, for scientific purposes, an aim which merits appreciation by all.

"As an international situation, it continued, the islands under consideration according to the mutual agreement, in which we in reality find them, so that each of the powers whose subjects visit them and there undisturbed follow fishing and hunting, as well as the Swedish Government may have undisputed access to found a permanent colony at any point which they may consider advantageous.

"This condition would be considerably altered, it is further stated, if anybody took complete possession of the islands.

"As the conditions now exist, the founding of a partial

colony would not necessarily include the possession of the whole. Those settlements founded there in the past by Russian subjects, and of which traces are still visible, are not mentioned, or considered by the Imperial Government as a sufficient reason for laying exclusive claim to the group of islands under consideration."

(Signed) J. SCHÖNING,
(Signed) A. SCHEEL

Herre Bohne, through whom it was transmitted, expressed the hope that this assurance would satisfy Mr. Jeldness and his principals, and added that it was impossible to give any other security.

The next question which came up was in regard to the tourist hotel at Advent Bay. This had been erected by the Vesteraalske Dampskibsselskab and, as it was not the property of the Trondhjem Coal Company, it was not included in the sale; they afterwards bought it however and offered to sell it at an additional price of eight thousand kroner. This also was made a part of the agreement.

III. BEGINNING OF THE ENTERPRISE

1. FIRST DEVELOPMENTS

IN THE spring of 1905 Munroe and Jeldness went to Norway to begin the arduous task of developing the coal-fields now fully acquired. They were greatly encouraged by assurances from Captain Naess, who had conducted an exploration of the region around Advent Bay the previous summer, that the quantity of coal was much greater even than they had judged it to be, that it was better than any English coal, indeed quite equal to the best Cardiff coal, and that it would improve in quality as the shafts advanced farther inward from the disintegrating influences of air and water.

They were confronted by the rivalry of a newly-formed Bergen Coal Company which, after the Trondhjem-Spitsbergen Kulkompagni closed their bargain with the Arctic Coal Company, had offered to pay two hundred and fifty thousand kroner for their land. But it was believed that the failure of the Bergen Company to do any practical mining during the the summer of 1904, owing to the lack of a harbor and facilities for loading, would so discourage them that they would discontinue the enterprise. Captain Naess with four men had got about one hundred and ninety-nine tons, forty-five of which he brought back to Trondhjem and sold at fifteen kroner a ton. Although he had found gas coal of the finest quality on the north side of Ice Fjord, the water there was so shallow that even in his small vessel he could not get nearer than one hundred feet (thirty meters) to the shore. It was learned that a ready market for any amount of coal from Spitsbergen would be furnished by at least three important Norwegian steamship companies, the State Railways of Norway, and the new road running from Narvik to the iron mines

of Gellivara. One company had agreed to take at least sixty thousand tons a year.

The Problem of Transportation. The question arose how to get the coal transported from Advent Bay to Norway.

As the Government had forbidden whale-fishing on the coast of Norway a number of whalers were out of business, and it was reported that one or more of these vessels might be hired for eight or ten thousand kroner for the season. As these ships were especially constructed for combating ice, and were equipped with blacksmithing forges, tools, and other implements, it was thought that such an arrangement might be practicable. The Trondhjem Company had a small sailing vessel which they were about to sell to some Swedes for fishing purposes; Munroe, however, came to the conclusion that such a ship would not be satisfactory for their coal freight. He reported that the Bergen Company had chartered a nine hundred ton steamship to take ninety miners to Spitsbergen in May.

The Bergen Company. In a letter from Trondhjem dated April 8, 1905, he gave further particulars of that company, in reality "The English Spitsbergen Trading Company," which seemed to be "making a great play" at Trondhjem. The head of it was a Norwegian Englishman who was a lazy drunkard, and bore such a bad reputation that it was difficult for him to get men to work for him. But having succeeded in getting four hundred and fifty thousand kroner to spend he was preparing to take nine portable houses to Icefjord, had ordered enormous quantities of provisions, and was planning to erect large gas and electrical plants, docks, and storehouses.

The engineer (Fangen) sent word through Herre Bohne, who was supplying him with preserved meats and other provisions, that he would like to make the acquaintance of the Americans; an appointment was accorded and they went to call on him. But he received them with cold and undignified haughtiness, and acted as if he were insane. Munroe wrote:—

"Of course his whole talk was to try to scarce us off and then

CAPTAIN HENRIK NAESS

he suggested that we should amalgamate, that two different companies could not make a success at the business. I told him *we* would make a success, if the coal is there, and *that* we intend to ascertain this summer. He then became blue and said he guessed he would quit if we were going ahead. I think I see what the scheme was. They had offered the Trondhjem people two thousand, five hundred kroner cash, but they refused. Then he and his company decided to make a big move this summer, thinking that the Trondhjem people would then be glad to come in, for they would not be able to work it alone. He is now greatly disappointed. Jeldness and others who have thought of the matter are of the same opinion. However, I do not think we need have any fear of them, for such a man could not make a success of anything."

One thing was certain: there was plenty of coal at Sassen Bay, at King's Bay, as well as at Advent Bay. And Captain Naess had offered to let Munroe take all the land that he had staked out, relying upon the Americans to give him whatever they thought fair and right. Moreover, as there was a likelihood of not less than a dozen or fifteen tourist steamers going to Spitsbergen that summer, there would probably be some sale of coal, if it were mined and teamed down to the shore.

2. A STEAMBOAT CHARTERED

A few days later Munroe wrote that after many disappointments and delays he had secured a steamer for the season. He had been carrying on negotiations for an old wooden ship, which, according to his spelling of the word, bore the rather ominous name of *"Drowning Sophie,"* and which was valued at thirty-one thousand kroner. The owner of the *Dronning Sophie* (that is, *Queen Sophie*), had gradually reduced the price to two thousand kroner a month, including services of the first engineer; but the deal was called off owing to the refusal of the German insurance company to make satisfactory arrangements. Finally he succeeded in chartering the *Ituna*, a steel steamship, which would carry five hundred tons of coal, for two thousand, five hundred kroner a month, that

price including the services of the captain. It was valued at seventy thousand kroner and the insurance cost only five hundred kroner for the season.

The First Sale of Coal. Munroe reached Advent Bay June 2. He had been compelled to run about forty miles to the westward of Bear Island on account of the ice, but found only a little in the bay and harbor, and that speedily took its departure. He almost immediately contracted to sell two hundred and ten tons to whaling ships at twelve kroner a ton, to be delivered on July 12, in case he could get that amount out and transported. He had reached the coal in the main opening, and found it of excellent quality. He was busily engaged in laying a tram line. He found the work extremely absorbing—in fact quite too much for one man to cover, though he was working all day, and often far into the night—if night could be regarded as a proper term for unchanging daylight.

He had discovered that the coal-seams were "persistent, extending through a very large area in directions at right angles." Some of them swept through no less than six mountains paralleling Advent Bay, and he uncovered the coal at a number of points at long distances apart, but there was so much loose earth, rock, and ice covering them that it was difficult to give an accurate idea of the thickness of the seams. He wrote on July 14:—

Choice of Location. "Where the opening was made by the Trondhjem people was entirely in the wrong place—in fact the very worst place that could have been chosen. It is in the nose of the hill; i. e., the hill slopes on both sides of the opening, one side along a river, and the whole formation has sagged, taking the coal with it, and the result is that the coal seam is twisted, distorted, and broken, rendering the coal loose and of no account. I drove in about twenty meters, and came to the conclusion it would be useless to go farther at this point. There are three or four seams, two of which are near enough together to work. The seams were so distorted along this line that it is difficult to say what the thickness

would be in the normal, but each of the two seams varied from eighteen inches to five feet. I have the tram line finished, and shall soon be taking down coal. Of course we have some coal out, but we shall not have so much to take down to Trondhjem as we had hoped. Our mine, if we have one at this part of the field, must be at a point about seven hundred meters to the east of the present opening. I am working there now, but it is a hard place to get into, there is so much shingle, stone and ice." He also reported that during a trip to Sassen Bay he had located a tract about fourteen miles long by twelve miles wide running back to the Advent Bay River, and also the land at Cape Boheman.

3. DEFECTION OF JELDNESS

Shortly before this Munroe tried to make definite arrangements with Jeldness. He told him that there would be work enough for them both, but Jeldness refused to stay, and declared that he could not afford the time. Oddly enough on the very day when Munroe imparted this information to Mr. Longyear, Jeldness gave an interview to the Spokane "Spokesman's Review." The article entitled "American Flag on Spitsbergen" showed that he claimed the whole credit of the expedition to develop the vast coal and iron resources of that country. A few extracts will perhaps prove illuminating: It stated that Mr. Jeldness had just returned from Norway after despatching a steamer with thirty-five men to the island. It premised that he had "associated with him two wealthy Boston men prominent in the steel trade." Their efforts to secure sufficient title to justify them in starting work in the Land of the Midnight Sun have a dramatic hue. Mr. Jeldness has been at work on the project for three years. Now, according to him, they had twenty-one feet of soft coal in sight on one harbor, and a vast volume of hard coal on another. There is also, according to Mr. Jeldness, "one hundred million tons of iron ore in sight."

Jeldness's Erroneous Statements. Then Jeldness's own words were quoted: "Our American-Spitsbergen coal and

iron enterprise is in a flourishing condition so far. We fitted out a large steamship last spring and sent it from Trondhjem, Norway, loaded with supplies and men, and with an American engineer in charge. We engaged Norwegian engineers and miners to accompany the expedition, to construct loading-docks, cable-tramways, etc., in Advent Bay, Spitsbergen, where some of our coal mines are located. . . . About three years ago, when we secured these iron fields in northern Norway and the coal fields on Spitsbergen, we obtained a declaration from the Government of Norway and Sweden to the effect that Spitsbergen is a 'No-man's land,' but on our return to America we consulted with the Department of State at Washington, and the late Secretary, John Hay, expressed it as the opinion of his Department that Spitsbergen was claimed by Russia.*

"As my Boston associates did not care to go ahead with a far-reaching undertaking, involving an expenditure of ten or fifteen million dollars, partly then in Russian territory, if Spitsbergen belonged to it, the opinion of our late Secretary of State delayed our enterprise just one year. Through the aid and courtesy of the Norwegian Government I finally obtained Russia's view on the question, and as it was similar to that of Norway and Sweden, it proved entirely satisfactory to my people, with the result that we again went to Norway, in January last, to lay the foundation of our enterprise.

"Russia would probably object to the annexation of Spitsbergen by any other nation, but the Government of Norway

*Mr. Longyear, when this dilemma came up, went to Washington and was referred by the State Department to the Assistant Secretary, who recommended asking Senator Alger of Michigan, to address a note to the Department in regard to the question: 'What nation claimed Spitsbergen?' It would be referred to the American Ambassador at St. Petersburgh who would ascertain from the Russian Government whether they claimed sovereignty or not. This was arranged and within a few days Senator Alger sent to Mr. Longyear the Assistant Secretary's letter stating that it was the opinion of the Department that Spitsbergen belonged to Russia. The Assistant Secretary had forgotten the conversation, and instead of cabling to St. Petersburg for the required information, disposed of the inquiry in the most expeditious manner possible.

would be glad at any rate to see the Stars and Stripes float over that continent. Now a fifteen-foot American flag made to order in Norway, is floating over our possessions—not in the sense of annexation, but as a warning to others to keep off that part of it which we have discovered and located. The Stars and Stripes also floated, together with the Norwegian flag, from the mastheads of our steamer as it left Trondhjem, and it was probably the proudest moment of my life when we steamed out of that beautiful fjord, and when nearly all the ships in the harbor were decorated in the flag language with greetings of good will and success to our expedition.

"The people and Government of Norway look with great favor on our undertaking, and aid us in every way consistent with the rules of honest diplomacy. They know that if the explorations which we are accomplishing this season are satisfactory the price of coal, for instance, will be lowered at least one-half over all of Norway, and that as a result the mineral resources of the country will be developed, and that the steel market of Europe will, within a very few years, be controlled by the owners of these enormous iron deposits of northern Norway; that is to say, they know that the industrial life of the country will be quickened and renewed prosperity for the land of the midnight sun will be assured."

After speaking of Spitsbergen as a once tropical land, Jeldness ended by assuring his readers that "a sojourn in the Arctic Ocean, under continuous sunshine, will grow hair on almost any bald head," but he disclaimed making such a rash statement for the sake of booming his real estate holdings on Spitsbergen: "I am not clamoring for a colony of baldheaded men there."

Jeldness Rebuked by His "People." His "people," as he called the Arctic Coal Company, were none too well pleased at this ebullition of egotism. Mr. Ayer wrote him that he thought not all his statements could be substantiated and added:

"I do not think that you were authorized to disclose to the world at large any of the plans that Mr. Longyear and I

may have. Publicity of this character is likely to hurt our enterprise, and I fail to see where any good can come of it." A few days later they informed him that in their judgment he had not complied with the terms of his contract with them, dated September 26, 1904, and they therefore reserved to themselves the right to decline to award him the full interest to which he would have been entitled according to its terms, and also the right to make with him such other arrangements at might seem to them equitable. Their argument was that he had not taken a sufficient part in the enterprise to satisfy the terms of the contract, but they assured him in reply to his protest that if the enterprise should turn out to be profitable they would undoubtedly reach some adjustment that would be satisfactory.

Purchase of Jeldness's Equity. The results of Munroe's investigations, and the evident demand for considerable coal delivered to ships at Advent Bay, made it evident to Mr. Longyear and to Mr. Ayer that there were great possibilities in Spitsbergen, and they accordingly determined to exercise their rights, in accordance with their arrangement with Jeldness, dated November 3, 1904, to purchase his equity in the option, and to eliminate him from further connection with the enterprise. "The writing of this letter," they notified him, was "a valid exercise of their rights under said option." He had expected to have an eighth interest, but, as he was unwilling to give all his time to the work, and as he had returned to America in the middle of June, leaving Munroe to carry on the preliminary work unaided, Mr. Ayer felt that he had broken not only the spirit but the terms of his contract, and while he was willing to remunerate him generously he thought that Munroe, who had really borne the heat and burden of the day, deserved a larger share. Jeldness's interest was purchased at a price that was satisfactory to him.

Activities of the English Company. Occasional references in newspapers to affairs in Spitsbergen also showed that the attention of speculators was attracted to the possibilities of wealth in the archipelago. Thus the New York "Sun" of

October 21, 1905, mentioned the activities of the English. It said:—

"No flag floats over the Spitsbergen Islands and nobody seems to want them, but it will not be surprising if the British flag should begin to flap above the glaciers next spring. In May last two British vessels steamed into Ice Fjord, the deepest indentation on the west coast, and fifty men who went ashore began the erection of eleven small dwelling houses in which they are to live next winter. These men are coal miners, and during the darkness of the long night they expect to give unusual animation to a bit of the Spitsbergen coast.

"They expected to illumine the darkness both of the winter night and of the coal mine with electricity, and landed a complete plant for the purpose; but the last steamer of the season reports that the Arctic miners will have to get along with oil lamps. They have been so busy preparing for the long night of industry that their electrical installation will not be quite ready; in fact, they have mined only about two hundred tons of coal, for the preliminary labor took nearly all their time; but they have a railroad in their mine that extends under cover down to the shore and they hope to pile up many tons of anthracite by the time the shipping season opens next year.

"The more Spitsbergen is examined the more promising, it is said, are the coal mining prospects along some of the coasts and in a number of the valleys. At this rate the neglected waif is quite certain to be adopted by some member of the family of nations."

With these considerations in view, Mr. Longyear and Mr. Ayer decided to form a corporation to take over the Trondhjem-Spitsbergen Kulkompagni's rights and properties as provided in the extended option.

The Arctic Coal Company was registered in West Virginia, 1906, with a capitalization of one hundred thousand dollars. Five thousand, five hundred dollars was retained in the Treasury; ninety-four thousand, five hundred dollars was issued in stock, one-seventh of which was consigned to W. D. Munroe as trustee to be paid to the Trondhjem-Spitsbergen

Kulkompagni, in accordance with the agreement embodied in the option. The remainder, eighty-one thousand dollars, was divided equally between Mr. Ayer and Mr. Longyear.

4. SATISFACTORY ARRANGEMENTS

The year 1906 marked the actual initiation of the Arctic Coal Company's constructive work in Spitsbergen. They had spent several thousand dollars in preliminary surveys, explorations, and development, and several thousand dollars more on account of the option and the purchase of the Tourist Hotel at Advent Bay. Two further payments of ten thousand and eight thousand kroner respectively were due on the culmination of the option. The two principals agreed to advance to the corporation for the purpose of putting it on a paying basis the face-value of the stock coming to them. The Trondhjem members, holding one-seventh of the stock, were not expected to finance the undertaking. It was regarded as fair however that the Norwegian stockholders should be represented on the board of directors.

Difficulty in Securing Ships. Before Munroe had left Trondhjem for America he had made, as it seemed, satisfactory arrangements with the Trondhjem Steamship Company for the lease of the old whaling steamship, *Fridtjof,* for the following summer. But so many inquiries in regard to its lease came from wealthy English and American sportsmen, and a still more definite demand from Wellman, who was planning to go to the North Pole in Dumont's balloon, and might be willing to pay as much as two thousand pounds for three months, that the price for a three-years' lease was increased to eight hundred pounds sterling for each season. And even then definite answer was refused. Herre Bohne wrote that he "found the price much too high for Norwegian affairs," and promised to inquire at Arendal, Tonsberg, and Stavanger, where whalers might be engaged. Later, on January 19, Herre Bohne reported that no whalers were to be had, and that the only ship available was the old *Magdelene* which had been used the year before. He also wrote, in quaint Nor-

wegian English, regarding the absorption of the former Trondhjem-Spitsbergen Kulkompagni:—

"I must tell you that we have no papers connected with the incorporation of the Trondhjem-Spitsberg Kulkomp., showing the purposes for which it is organized; what we had, have you got a copy of. We have dealt after Norwegian law and justice, after which the majority decide all questions. Any capital stock have we never had; but on the contrary have we paid the four expeditions we have sent to Spitsbergen, 1900-1904. Hoping to get proposal for laws for the new company from you; I mean, that the three hundred and fifty thousand Kroner as mentioned in the contract, must be the amount of the capital stock for the new company, now without any considerations to the former expenses."

Mr. Ayer was uncertain whether he meant by "former expenses" his or theirs.

Preliminary Proceedings. It was decided that Munroe should go across as soon as it was practicable and select a ship himself as well as settle the legal questions that had arisen in taking over the Norwegian company and forming the new corporation. It seemed very important to avoid delay; the loss of a month or two at the beginning of the season might derange the whole summer's work. Accordingly, in March, 1906, Munroe sailed for Norway by way of England. He spent a fortnight in Sheffield in looking up and getting familiar with the proper places at which to purchase goods, and in making arrangements for having them shipped. He also engaged a mine foreman and three or four English miners to take with him to Spitsbergen.

Tenders From the English Company. Mr. Black, the managing director of the Spitsbergen Coal and Trading Company, hearing that he was at Sheffield, came down from Scotland and tried to persuade him that an amalgamation of the two companies would be profitable. Later, at London, Mr. Bainbridge, "the money man of the English company," interviewed him. Munroe wrote: "He was a perfect gentleman throughout our conversation, and his feelers were out in the

same direction as were Mr. Black's, only a little farther, and he indulged in a little more 'bluff' in his quiet and gentle way."

In Copenhagen Munroe made inquiries regarding steamers but found nothing satisfactory. He arrived at Kristiania on March 31, and spent the next four days in a fruitless quest. At Fridriksstad, eighty miles distant, he found a small wooden steamer for which the owner demanded two hundred and twenty pounds a month, but it had accommodations for no one but its captain and crew. Neither could he find a suitable steam launch, those available being both too small and too frail. There were prospects of a great "boom" in mining and water-power locations in Norway, and many English and German engineers were reported as arriving, on the *qui vive* to make fortunes.

Possible Claim Jumpers. In April Munroe cabled that the Trondhjem-Spitsbergen Company would not agree to transfer their property without the insertion of a clause in the contract to the effect that they would not guarantee against the possibility of claim jumpers having seized their lands in Spitsbergen. It was a matter of doubt who would do such a thing between the time when Munroe left Advent Bay and the opening of navigation. Mr. Ayer wrote Mr. Longyear:—

"There are only two possibilities: one the English Company, secondly, Fangen. From all we can learn from Munroe, the English crowd are reputable people, and hardly likely to have done this. Fangen, as I understand it, has been in England all this winter, and has hardly got started as yet. Further, all we are risking by authorizing Munroe to close subject to this condition are the cash payments to be made to the Trondhjem-Spitsbergen people—about five thousand dollars.

Maintaining the Title. "As this is only a small part of the expense that we have already incurred and must incur this year, it seemed to us unwise to delay and endanger our purchase from the Trondhjem people until Munroe had been able to get to Spitsbergen and report; which would have caused him trouble and delay. Further, you will remember that neither of us, nor Munroe, were sure that the Trondhjem

people would in any way warrant their title. In view of all these considerations we hope that our action [in cabling to Munroe that the conditions were accepted and urging him to go to Advent Bay as soon as possible] would meet with your approval." He added:—"We have so much at stake at Spitsbergen that we should have to do everything in our power to maintain our title, fight if need be; and I am going to suggest to Munroe that he take arms with him sufficient to arm a reasonable number of men at any time it should be necessary to defend his holdings."

He wrote to Munroe on May 10 confirming his cable and said: "I cannot imagine that any other expedition has got up to Spitsbergen ahead of you that you would not have heard of, and that could have jumped our properties, I take it you believe that we are safe from any interference on the part of the Spitsbergen Coal and Trading Company. If the hotel has burned up it would be because somebody has been occupying it, and you will be able to ascertain who that is, and would have recourse against them if they were responsible. Hereafter as we agreed, we must have reliable parties in charge of our properties continuously."

Chances Against Trouble. The Trondhjem-Spitsbergen Kulkompagni refused to be responsible even if any jumping of claims or damage to property had occurred before the transfer was legally made, and Munroe thought that possibly the banks were pushing them for payments. But he thought there was not one chance in a million that anything untoward had occurred at Advent Bay, and that the risk of inserting the extra clause was practically nil.

He wrote that he was still at his wits' ends to find a suitable ship, and that it was quite likely he should wind up by taking the *Ituna* again, and he notified the Corporation that he was so deluged by applications from hundreds of men who wanted work, hiring them, signing contracts, and attending to other business that he had been obliged to lease offices at Trondhjem. He had found that it was far cheaper to buy tramways, aërial railways, and other such machinery in Europe

than in America. A week later he wrote from Kristiansund detailing his pleasant experiences with the English Company, and noting that he had given to Mangham, who seemed to be an absolutely reliable man, authority to act as his (Munroe's) watchman, and to eject all intruders. "As to the head officials of that company, they have, as you say, expressed their recognition of our rights in many ways. They are now requesting some favors in the way of carrying a few sticks of timber to Advent Bay, and to tow a lighter as far as Tromsø." On the other hand Munroe had received permission to send two men on a whaler that was to carry their Norwegian agent, Herre Bruvik, to Spitsbergen that week.

He himself expected to start about May 25, the delay having been caused by the difficulty in securing a suitable ship, and the necessity of arranging with certain farmers to get out large sticks of timber which none of the mills could furnish. He says he was at Kristiansund to see some smaller dock-timbers which he heard could be bought very cheap, but he found them no good, and had wasted three days on the job. "It is not easy," he said, "for one not connected with it, to understand the difficulties in obtaining and putting into service where and when one wants a suitable ship." When he finally decided to take the *Magdalene* he learned that she had been sold, and he regretted it, for he thought that with good machinery she might have made a first-class ship for their purposes. He noted that there were to be many more ships than usual plying between Norway and Spitsbergen that summer—a cargo line was to be established from Hammerfest to various points in the Archipelago; regular mail steamers were to make several trips from Trondhjem; also several tourist excursions and a large hunting party from France were planned, so that Advent Harbor was not likely to be isolated.

He ended by hiring Herre Selmer's iron steamship, the *Primo,* which carried about eight hundred and fifty tons. A further delay was caused by an accident to the rudder which necessitated putting her into the dry dock. It took several days and nights to get the cargo on board; one night no crew was

obtainable. At the last moment when the ship was ready to sail the keeper of Munroe's horse sent the wrong animal down, and that wasted three hours more. Then they had to stop outside Trondhjem harbor to take on three and a half tons of explosives which had been bought in England, and which, on account of both the British and Norwegian laws had cost "the tremendous sum of one thousand Kroner" to transport from the train at Middlesborough, England, to Trondhjem, and to deliver on board his ship.

The Second Expedition Starts. On June 4, 1906, he wrote from on board: "It is a great relief to be able to report at last the departure of our second-year expedition for coal-mining work at Spitsbergen. I can not begin to tell you about the amount of work, the irritating and almost maddening effect of many things in connection with the getting off of this expedition. The delays and disappointments were numerous, but we are now started, and so I can take time to breathe for a few days while on the way. For the past ten days I have not had time to sleep more than three or four hours each night, so you may be able to realize how glad I was to get started."

The big timbers were loaded on the deck and fifty men were carried in the afterhold. They towed a large lighter for the English Company, and hoped if the weather was favorable to deliver it at Spitsbergen; otherwise they would leave it at Tromsø.

5. THE FIRST LABOR TROUBLE

Munroe landed safely at Advent Bay with his cargo and men, and immediately tackled the great task of establishing the mine. It was probably fortunate that he was delayed in getting started from Norway, for the spring had been backward, and the approach to Spitsbergen had been made difficult by unusual quantities of drift-ice. He found that the English Company had not done good work during the previous winter. They had sent an engineer in place of Fangen, but he seemed to have frittered away most of his time in trying to build a

gravity tram outside, instead of getting out coal, with the result that instead of mining at least six thousand tons, he had got only about five hundred; he had been called home by the death of the director, Black, and no one knew what the future of the English enterprise would be. Their men had been almost without food for nearly a month. It was evident to Munroe that they could never compete with the Arctic Coal Company.

The old proverb, "It never rains but it pours" was illustrated by further delay caused by a tempest of wind blowing down from the head of the Bay, and continuing with unexampled violence for twelve days, rendering it impossible to unload the boats. Moreover they could not complete the dock which it had been planned to build during the short summer. Munroe was convinced that no such construction could resist ice-pressure unless the spaces between it and the shore were riprapped. But he was preparing everything for building the dock the next season as soon as the ice should go out. He reported that the upper terminal and the coal-pockets were ready for the erection of the wire tramway. He was constructing a surface tram from the railway at the bottom of the hill up to the mine so as to get timbers and other material needed for the mining operations, and also for conveying coal down to the camp. Camp conditions for so many men were not very satisfactory, and caused complaint which was made the excuse for a strike. Munroe's account of the way he handled it is quite characteristic:

Handling a Strike. "I am sorry to have to report that for the past two weeks things have not been running very smoothly with our labor. Nobody had heard any complaints from the men, and none of us knew but what everything was O. K., when suddenly nearly all hands went on strike (so called). Of course it was not a strike for they are under a rigid contract for the summer. They wrote out a long list of demands including increased pay, and declared that if I did not sign it they all were to quit now and go back to Norway on the first steamer. They demanded also full pay and full board

free while on the strike. I'll leave it for you to imagine how I went at them, and can say that nearly all are now back to work and they did not gain a single point. For the last week I gave them nothing but hard tack to eat, and that I think did much towards bringing them back to their levels.

"It was in this case as many others, it was all caused by a few bad men who drew in others, and finally they threatened the remaining good men and frightened them until they came in also, but as soon as these latter men realized that I could protect them and *would,* they came back to work. It was all a scheme to get increased pay. A few still say they are going back to Norway, and four men I have discharged. My four English miners were not in it at all, so I kept the headings in the two mines going, but more slowly of course."

Lack of Govermental Protection. The lack of any legal control in the islands was a serious menace; this the English Company evidently realized as well as the Americans did. There was no way of coping with an outbreak of violence, should any such difficulty occur, and it was always imminent. Munroe received a letter a few weeks later from E. V. Weston, Secretary of the Spitsbergen Coal and Trading Company at Sheffield, stating that they had been having some correspondence with the English Foreign Minister, and with Dr. Nansen, the Norwegian Minister in London, with a view to getting protection and assistance for the government of that part of the Island of Spitsbergen of which they had taken possession. They proposed that their manager should be appointed as a magistrate, empowered to deal with such offenses as might be committed by their employees or by other persons visiting there, and that their manager should be recognized as an official of the English and Norwegian Governments.

The British Foreign Department replied that it was unable to comply with their wishes in giving official recognition of their position, as the island was outside British jurisdiction. Mr. Weston thought that perhaps Dr. Nansen might adopt a more sympathetic attitude if he were approached by both the English and the American Companies, and he proposed that

they should adopt the following proposition as suitable for consideration:

1. That in their respective contracts with the Norwegian laborers employed by the two companies a clause should be inserted that all offenses, conflicts, or differences, should be settled by a Norwegian Court at Hammerfest.

2. That the managers of each company should be empowered to exercise the same authority as if appointed by the Norwegian Government.

3. That both companies should either together or separately make signed application to the Norwegian Government, that since the present situation of affairs was unsatisfactory, and recognized authority was desirable, it should appoint a magistrate or magistrates to preserve order on the island.

It was desired that other organizations, such as the North German Lloyd Shipping Company, and even private persons who had visited the islands, should join in this petition; but Mr. Weston wrote that even if no one else took such a course he had no doubt that the English Company would make the application on their own account.

Of course Munroe felt that he had no authority to involve the Arctic Coal Company in such a scheme, desirable as it might seem, but in writing about it he gave an additional reason for Governmental control. He said:—

"The matter of preserving the game at Spitsbergen, especially on our own property is another question of importance. So many tourists and hunting-parties are flocking to Spitsbergen now, more every year. There was a large French ship here this summer with about two hundred armed men, and they went out slaughtering reindeer at Sassen Bay. There must be some means of preventing a repetition of such proceedings. The people who live at Spitsbergen, cut off from fresh meat supply, should be entitled to what little game there is."

Possibility of War. An echo of this particularly exasperating state of affairs in "No-man's Land," with ominous hints as to international complications and even possibilities of war, may be found in cablegrams to two Washington news-

papers:—The "Herald" of November 3 contained a paragraph with a "scare-head," "Sweden Vext at Norway" and embodying this statement from Stockholm:

"Serious trouble between Sweden and Norway seems likely to result from the dispute over the ownership of the Island of Spitzbergen. Norway is disposed to submit the controversy to The Hague Tribunal, a method of settlement to which Sweden emphatically objects, maintaining that it would be ridiculous for the kingdom to submit to arbitration the question of title to an island which it claims always to have owned. The German press is supporting Sweden, and the English papers support Norway in the dispute."

Two days later the "Evening Star" printed a somewhat similar rumor but emanating from Copenhagen. It was headed: "Rich in Minerals and Crime. Norway wants to annex the Island of Spitzbergen":

"A portion of the Norwegian press is at present agitating for the annexation by Norway of Spitzbergen. The island is in an absolutely lawless state, and crime is very frequent. There are neither laws nor officials to administer them. A large portion of the population, which consists chiefly of miners, whalers and fishermen, is said to be leaving the island owing to its lawless condition. The possession of Spitzbergen is likely to be of immense economic importance, as it contains vast deposits of valuable minerals. It is announced from Vardø that Russia is preparing a fleet of five ships in the White Sea, which is intended next year to visit Spitsbergen, and the northern European coasts."

It was evident that no one country would be allowed to take possession of Spitsbergen, and that mutual jealousies would stand in the way of an easy settlement of the vexed question.

In a letter written August 7 Munroe gave some particulars regarding one of his engineers. He said: "In the first place he is not naturally adapted to this kind of business, to this kind of a life especially. It is his nature and its resultant workings which make him absolutely unfit, and a drag to our success here, as well as a damper on the happiness, peace and

well-being of the camp. It would be impossible for me to consider retaining him here over the winter. He has been untrue and disloyal to me and the interests of the company ever since he reached Trondhjem. I had two or three friendly talks with him about it, and I advised him in a kind way. He admitted the wrong, and promised each time to do better. But as soon as my back was turned he swore to do worse. He is a childish, inexperienced fellow anyway, and one who has been spoiled. He is funny (a stage character), wants to do the big 'I am' and be the idol all the time. It is his jealous, envious, and deceitful nature which has brought him where he is. He has insulted everybody about the camp. He has no grievance whatever, because we were all nice to him. But he wants to be petted, coaxed, and housed like a prince, and made boss of everything. Such things could not be of course, and we see the result." And a postscript added: "Should you wish confirmation of my statements about him, several of my trustworthy men are willing to make written statements about his actions and what they think of him."

Men to Overwinter. In his last letter dated at Advent Bay he wrote that he was planning to keep twenty-five or thirty men there during the winter to push the mine development as fast as possible, and also several carpenters to carry on the construction work necessary for installing the tramway. He reported that the main entry in the lower seam had been excavated for about two hundred and twenty feet, with parallel entry and cross-entries connecting them. The future looked roseate: "There is about four and one-half feet of solid clean coal. It contains two streaks of cannel, about six or eight inches in all. By next year these mines should be in good condition to begin a steady production, providing of course that no serious faults are met with to hinder the development at too great an extent. We have met no faults thus far. On a good but thin seam westerly from here two and one-half miles, and below where we worked last year, we have driven in a distance of sixty feet. It is a three-foot seam. Of course no work will be carried on there during the winter. When our steamer

comes we will discharge as soon as possible and expect to make a trip to King's Bay, and also to see Mr. Wellman to talk over a plan to have a wireless station here next year."

Visitors at Advent Bay. Four regular cargo steamers had visited Advent Bay during the summer. Two tourist steamers had also just come in, and among the visitors was Herre Bohne, who made them a two days' visit. The managing director of the Nordenfjeldske Company was desirous of making a contract for fifty thousand tons of coal to be delivered the following year for use in the northern part of Norway from Bodø North. Such a demand augured well for financial success, and he thought there was no danger of competition from the English Company because their coal was not good and ships would not care to load at their station. He reported that Albert, Prince of Monaco, had been there with his yacht and a small steamer, and had bought from the English Company one hundred and fifty tons but would not go across the Bay to load, and they had to tow it over to the *Princesse Alice* which was anchored in the Arctic Coal Company's harbor. The Prince afterwards became a member of the Scottish Spitsbergen Syndicate and subscribed to its stock-account.

6. QUANTITY AND QUALITY OF THE COAL

Munroe stayed at Advent Bay until October 2, returning on the *Ituna* with steam made by the Advent Bay coal. He reported that it was wonderful; "the engineer and firemen say it is much better than the English steam coal." A few tons of it were left over, and he gave some of it to the Railway Department at Trondhjem, who had tried it under their stationary boilers, eliciting the highest recommendation, as making very little ash and an extraordinary amount of steam. "Next week," he said, "they are going to try it on the locomotives. So it seems we have settled the question as to quantity and quality of our coal-fields, and that it remains only to get the coal into ships in a marketable condition and send it to Norway.

Weathering of the Coal. "There is, however, one characteristic of the coal which is as yet undetermined, i. e., as to how it will stand the action of the weather in storing for a considerable length of time. Some coals crumble to pieces when stored in the open weather. Our coal is fairly tender, but I do not believe it will yield too easily to atmospheric agencies, for I notice all over the surface of the mountains and in the streams, at Spitsbergen, lumps of coal which are hard and apparently well preserved."

He reported that he had made an agreeable settlement with the unsatisfactory engineer, and got a receipt for settlement in full. "He admitted everything to me long ago, and I now have a written statement from him. He apologized many times, but I dared not jeopardize the situation at our camp in order to try him further; he had failed too many times before, after making solemn promises. He is a very sorry fellow now, and says he has had the one great lesson, and that it will make a man of him."

A Large Order. In regard to the demand of fifty thousand tons of coal, he warned the company not to take it too seriously:—"We surely shall be able to market some coal toward the end of next summer, but of course not that quantity. We must properly prepare our coal before it goes to market, i. e., classify it by screening. The English Company have been selling to a few boats at Advent Bay without properly screening their coal, and the result is their coal has a bad reputation. Of course their coal is not of good quality in the first place, being very high in ash and mixed with stone, but it could be made better by screening and picking. Besides being high in ash, their coal-seam has two bands of slate in it, so this causes some stone to get into the coal which makes it even worse. Our four by four and one-half foot seam is absolutely free from dirt of any kind. The upper seam has a little dirt, but the whole would average well, especially as a house coal."

Wasteful Methods. He spoke with some justified scorn of the way the English Company was wasting resources in

unnecessary frills; they are building large fancy buildings, club-houses, stores, etc., and also putting up machinery, electric light plant, and the like, but they have been, and are now, neglecting the development of their mine for the things which should naturally come after the mine is in condition to make use of machinery and put out coal."

The *Ituna* reached Advent Harbor on its last trip on September 12 and little time was left for the final arrangements. He succeeded, however, in building a large cook-house, and an eating-house. He left Mr. Bert Mangham in charge of the winter force, with the design of driving the main entry with all speed so as to open out as large an area of coal as possible, ready to attack at any time. The carpenters were required to frame and make ready all the timber for the coal-pocket at the upper terminal of the company, and the dock at the lower terminal.

Longyear Valley Named. He reported that it was found impossible to accomplish any regular work at other points on the Ayer and Longyear lands, but that he had surveyed the great valley on the south side, and named it after Mr. Longyear. With a few men he made a trip to Cape Boheman, and had taken out a little coal from a seam there. He had also prospected at Green Harbor, but in the limited time at his disposal had failed to locate the seam in available places. In order to secure a clear title to the property he had left a man to winter at the whaling-station; at Sassen Bay a small house had been erected for the same purpose. He felt no doubt that they had "the cream of the situation at Advent Bay," and recommended the policy of getting the mine there on a dividend-earning basis first, and then developing other mines as circumstances counselled. They had taken the proper measures to hold the other coal-fields, and would be able to institute work on them on a more extensive scale each succeeding year. He noted that he had found an opportunity to buy from one of the Norwegian stockholders eight hundred and ten shares of Arctic Coal Company's stock for five hundred and fifty dollars, and proposed to take it to England where he

opined he might sell them at a much advanced price. He urged that in view of the high cost of chartering vessels for collier service it might be best to purchase a steamer, and the Company replied that if he should find such an one as seemed desirable, the money would be well spent.

7. TRAGIC DEATH OF MUNROE

After Munroe had arranged affairs at Trondhjem satisfactorily for the winter he proceeded to Leipzig, where he ordered a wire-rope tramway from the firm of Adolf Bleichert and Company, who made a specialty of that kind of apparatus, and installed it in all parts of the world. He left his wife at Dresden to await his return and, after a brief delay at Sheffield where he ordered some machinery and equipment for the mine he returned to Boston, made his report, and received authorization for the proposed work and attendant outlays for the following summer. He then went to Lansing, Michigan, and while there received a letter from Herre Bohne, who offered his services to the Arctic Coal Company as "a fast representative there in Trondhjem whom the Company can put one's trust in"; having time at his disposal he was willing to devote it to the company, if he could "get a suitably damage for the work." Herre Bohne proved to be a faithful and always friendly coadjutor throughout the history of the enterprise.

A Frightful Catastrophe. In February, 1907, Munroe returned to England, and on the 20th took passage on the steamship *Berlin* at Harwich for Rotterdam. The next morning in a furious storm, as the ship was about to enter the river at the Hook of Holland trouble with the steering-gear developed, and a disastrous wreck ensued. Only fifteen persons out of one hundred and forty-three were rescued. Munroe was among those lost.

Four days earlier—on February 16, 1907—Mr. Longyear and his wife had sailed from New York on the White Star Steamship *Cedric,* intending to make a trip to Egypt and the

Holy Land. On their arrival at Naples they found a number of telegrams and letters announcing the tragedy. Mr. Longyear was so dazed by the shock of it that it was several hours before he could think connectedly; the pandemonium of the landing was a welcome alleviation of his agitated thoughts.

A Change in Plan. A message from Mrs. Munroe stated that her husband's body had been recovered and that there were many details which she could not attend to alone. Mr. Longyear immediately decided that they must give up their trip to the East. The agent telegraphed to London, and obtained permission to cancel the tickets and exchange them for the journey north. With much difficulty, they rescued their luggage from the ship bound for Alexandria, to which it had been transferred, made the necessary changes in their clothing, and left Naples by way of Rome. There, by scattering among the railway officials "about half the amount of silver that a 'wagon-lit' would have cost," they secured a section in a day coach, and left at ten p. m. They made themselves as comfortable as possible with pillows rented at the station, and slept in their clothes. Making a flying trip through Switzerland they arrived at Rotterdam in forty-four hours from Naples, and found Mrs. Munroe "in a more collected and tranquil condition than might have been expected after the dreadful ordeal she had passed through."

Arrangements were made for shipping the body to his parents in Lansing, Michigan. Mr. Longyear learned that his money and letters of credit had been found in his clothing, but that all his London luggage was irretrievably lost. His dunnage, with the effects of the other passengers, had been packed in iron-bound boxes, transported on open cars to Harwich, where they had been lifted from the cars by cranes and stowed on the deck of the steamer so as to be reshipped when the voyage should be finished. None of the boxes had been found, and not a piece of luggage was at the company's warehouses. Among the articles lost were his reports and memoranda relating to the work at Spitsbergen and to the arrangement which he had made or contemplated making. It

was hoped, however, that the Government of Holland would engage divers to search for the missing baggage*

It was decided that Mrs. Munroe should remain in Europe where she might be needed, since she knew more than any one else about her husband's work, having accompanied him to Spitsbergen the summer before.

Mr. Longyear Takes Charge. On March 6 Mr. Longyear received this cablegram from Mr. Ayer: "Knowing no alternative, are you willing to personally conduct Spitsbergen enterprise this summer?" This was followed by a letter: "I sympathize with you deeply in the loss of this able and promising relative, whom it will be hard to replace. I am all the more anxious to get word from you, as I do not know what action you will wish to have taken in regard to continuing the work at Spitsbergen. It seems very desirable that an expedition should go up to Spitsbergen not later than the beginning of May, so that we can get the tramway in place this year; and of course it is absolutely necessary that the men who have wintered on the island be relieved. What we want more than anything else at the present moment is an efficient, reliable manager, even if he should not be an engineer, though that would of course be a great advantage. The English foreman can probably take care of continuing the work of the coal-mine, and I suppose Bleichert's man will take complete charge of the construction of the aerial tram."

This letter made various suggestions about the supplies that Munroe had ordered, about the timber work and the required alterations in the steamer which they had purchased, and about purchasing the launch for which Munroe had been negotiating. Another letter dated March 4, and received on the 18th, added to the request in the cablegram: "If you are willing to do this, it will insure the successful starting of the

*Not a piece of baggage was ever found and very few of the bodies of passengers were found. The coast was patrolled for great distances by people employed by the British Government looking for the body of a "King's Messenger" who had been on the *Berlin*. He was supposed to have important State papers on his person wihch it was not desirable to have fall into the possession of strangers.

enterprise, and be a great relief to us." With characteristic energy and efficiency Mr. Longyear immediately proceeded to take upon himself the burden of this work.

A Christian Science Service. A memorial service for Munroe was held at the hotel, attended by the American Consul and several others. Those that attended it were pleased with the simplicity, beauty, and dignity of the occasion. Many had never before been present at a Christian Science funeral, and it was noticed that all paid the closest attention to every word that was said. On Saturday, March 9, Mr. Longyear went to the bank of the River Maas and saw the steamship *Suydendam,* bearing Munroe's body, start for New York. He remarks that Mrs. Munroe "could see the steamer from the window of her room as it turned around in the river before the hotel," and he adds: "I rejoiced to think Will himself was not there. He is with us still."

8. MR. LONGYEAR TAKES COMMAND

Three days later Mr. Longyear was in Paris, where, as his outfit was intended for a warm climate, he was obliged to exchange it for clothing suitable for a very different one. He and Mrs. Longyear spent a few weeks in France and Germany. At Leipzig he visited the factory of Adolf Bleichert which was situated in the country at Gohlis. He made the final arrangements for a rope-way, guaranteed to deliver one hundred tons hourly. The firm agreed to send up an engineer to erect the tramway. After a brief visit with Mrs. Munroe at Dresden, where she was planning to live for the following winter, they went to Bremerhaven and on March 26 Mrs. Longyear sailed for New York on the big North-German Lloyd steamship, the *Kaiserin Auguste Victoria,* twenty-two thousand tons, leaving Mr. Longyear to continue his preparations for the journey to Norway and Spitsbergen.

The Kiel Canal. He sailed from Kiel to Kopenhagen. In view of the later fate of the great Canal one passage from his diary is interesting: "The steamer left at eleven A. M. It was a pretty sail down the harbor. The hazy atmosphere hid

all distant views, but those near by were enough. A number of warships and cruisers were at anchor or in the docks, and as we got farther out we saw several vessels, despatch-boats, torpedo boats, etc., at drill and practice-work. The battleships, cruisers, etc., looked very mysterious as they developed from a faint white blurr in the haze to a warship ready for action. The run to Korsar was without incident, except that I scraped acquaintance with a young Norwegian engineer who was returning home after six years in South Africa. Nothing special developed, however."

A Wintry Landscape. As he proceeded north, winter again came into evidence; the fields were still covered with snow, which in place seemed to be two or three feet deep, and the lakes were hidden by solid-looking ice; but as the latitude was about eight hundred miles north of Marquette it did not seem surprising. Mr. Longyear thought the people all looked as if they did not mind what kind of a winter they had, being robust and cheerful of aspect. He arrived at Kristiania in the afternoon of March 28, and hoped to accomplish a little business before dark, but it was Maundy Thursday,—a Church holiday—and everything was closed. Even the bakers had not baked bread. The next morning he took the train for Tønsberg, where the vessel purchased by Munroe was undergoing repairs and alterations. There he was met by Captain Naess who had been engaged to superintend the work, and to take charge of it after it was completed. Naess was then a vigorous young man of about thirty-seven, and had been an Arctic sailor and hunter for more than twenty years, and therefore had a remarkable knowledge of the regions north of Norway.

An Epidemic of Holidays. At this particular time there was a regular epidemic of holidays. According to Norwegian Law persons working on a Church holiday are subject to a fine. Therefore there was nothing doing on Good Friday. The next day was a half-holiday. Sunday was Easter, and Monday was another Church holiday. There was almost a whole week devoted to festivities rather than to work. Mr.

Longyear, realizing that it was important to get the ship ready for its voyage to Spitsbergen, asked the superintendent of the shipyard if the men could be induced to stick to their job during this holiday season; he replied, "They will—if you will pay their fines;" but that he did not care to do.

Tønsberg, the Oldest Town in Norway. The enforced leisure gave Mr. Longyear opportunity to become well-acquainted with Tønsberg, reputed to be the oldest town in Norway—dating back to Harold Haarfager (the Fair-haired), the first King, who died in 933, after a reign of seventy years. On Castle Hill there is a modern tower which affords a fine view of hills, bays, streams, fjords, farms, and villages. In the rooms are fine interesting collections of the rude stone implements found in the neighborhood, as well as of bronze and iron implements and weapons. Near by are the foundations of an ancient castle and church, built no one knows how long ago. Originally the top of the hill which is very precipitous, was defended by a wall built of immense rough stones. The famous Viking ship, which is exhibited to tourists in Kristiania, was found near Tønsberg about half a century ago. The little town is the center of the Norwegian whaling and sealing industry, and more than a hundred hunting-vessels sail from there every year.

On Saturday Mr. Longyear went with Captain Naess to consult with the ship-building firm which was making the repairs on the ship. There was a dense fog, and they had to be rowed across the harbor. After receiving assurances that the work would be finished in about three weeks they went by train to Sandefjord to look the craft over. It was an old whaler built in 1872 with oak sides from two to three feet in thickness, and with bows fourteen feet thick and braced and cross-braced with oak and iron to battle with the ice. The repairs were well along, but no work was doing. The first step toward getting her ready was to clean out the dirt and grease left from former voyages. Tons of it had accumulated, and its only advantage was that the whale-oil had thoroughly soaked into the timbers and planking of the ship and preserved

them. It was thought that the cleaning, scraping, and burning processes would effectually dispel the ancient odors which Arctic explorers have found the bane of vessels hired of whale-fishermen. Fresh paint and the first cargoes of new lumber which were to be taken to Spitsbergen would also tend to cure the malodorous malady.

Mr. Longyear and Captain Naess walked about two miles farther to a whale-oil refinery, belonging to the man who owned the whaling-station adjoining the Spitsbergen property of Ayer and Longyear at Green Harbor. Of course, the all-prevalent holiday caused the place to be closed. The road to it was effected through a narrow cleft in the high rocks, and at one point a huge boulder, lodged in the defile, had been partially blasted away to afford "head-room." In front of the house belonging to the establishment there was a gateway formed of the lower jaw-bones of a whale. They were also interested in coming upon a number of *bautastener,* or ancient grave-stones, made of long rough blocks of porphyry, from twelve to sixteen inches in thickness and from eighteen to twenty-six inches wide, standing about six or seven feet high. No inscriptions on them could be found, but the corners were roughly shaped; they had evidently stood there for centuries. They returned to Kristiania at midnight and expected to take the morning train for Trondhjem; but the morning train did not run, it was another holiday! The baker had not baked since the previous Wednesday and the Grand Hotel served only dry, stale bread and rolls; at ten o'clock the barber hastened to close his shop;—otherwise he would have had to pay a fine; for the same reason the tailor refused to press any clothes.

Taking the night train on the narrow-gauge road, which runs through splendid scenery skirting a swift river, Mr. Longyear and Captain Naess arrived at Trondhjem at seven-thirty in the morning of Tuesday, April 2. Here a great accumulation of mail was waiting for attention. Among the most important matters was the choice of a successor to Munroe, who had won for himself a very high standing among the Nor-

wegians. Herre Fr. Bohne, as soon as the news of his "dreary fate" reached Trondhjem, had written expressing his great sorrow and speaking of him as "well known as a respected person, who will be very difficult to replace with another of his laboriousness and interest for the Company."

Mr. Longyear had written from Naples to Mr. Ayer suggesting his nephew, Frederick P. Burrall, and another person, as a possible successor, but as Burrall was in Los Angeles and likely to be detained by family matters for some months, he thought it dubious if any arrangements could be made with him.

9. GILSON ENGAGED AS SUPERINTENDENT

In the mean time Professor Wadsworth of Pittsburgh University had suggested a young man named Kenneth L. Gilson, who was at that time in the employ of a coal company in the Indian Territory. Gilson was willing to undertake the responsibility. He wrote the Arctic Coal Company from Hartshorn on March 11, giving interesting particulars about his qualifications. He said:—

His Letter. "Am twenty-six years of age, height about five feet seven, weight one hundred and sixty, single, of very good health, strong, and of good habits. Am a mining graduate (Pennsylvania State College), and have had about three the conditions which you mention. Have purchased table-knowledge of coal-mining methods from actual experience and study in coal-mines of Pennsylvania and Indian Territory. Am a competent draughtsman and thoroughly familiar with the drawing of plans, ship-details, maps, profiles, sections, and general office-work. Have a good practical system of filing notes, drawings and general information and data. Fully understand the use of level and transit on both surface and underground surveys and have acted as chief of party on extensive work of this character.

"Have acted as inspector for my employer on contract work, consisting of dams, canals, flumes, culverts, brick and stone foundations, and vitrified pipe lines.

"Together with my engineering experience I have had a good business-training, and have the ability to grasp different problems with a view to both practical and economical consideration. Have been quite successful with men under my charge, and feel thoroughly capable of handling the men under the conditions which you mention. Have purchased table supplies for twenty-four men for a period of nearly one year.

"I have carefully considered this proposition, and am satisfied of my ability to carry on the work to your complete satisfaction.

"I believe that I have a fair share of good common sense and judgment, and that this, together with a capacity for hard work, will accomplish the desired results."

Gilson Engaged. This frank, manly communication, and the fact that he was immediately available decided the matter; Mr. Longyear found in his correspondence a cablegram announcing that Gilson had been engaged, and was on his way to Norway. A letter followed in which Mr. Frederick Ayer reported that Gilson impressed them favorably, as intelligent, ambitious, and capable, though rather young for the post; but as Mr. Longyear would see how he took hold, and be able to advise the home office whether or not it would be better to have an older and more experienced man to act as head of the enterprise. Another letter expressed the great gratification of Mr. Ayer and his son that he had been willing to forego his trip to the East, and proceed to Norway to manage the enterprise until some satisfactory man could be found to take it off his shoulders.

Herre Bohne's Friendly Interest. Mr. Longyear soon got into touch with Herre Fr. Bohne, who, as will be remembered, was one of the original stockholders. He had shown himself friendly and anxious to help in every way. In a letter dated March 9 he had offered to take care of the interests of the Arctic Coal Company just as his own, but as he was not a rich man he felt that he ought to have a small fixed salary. He wrote in his picturesque Norwegian-English:—

"I have already in all the years had very much work for

KENNETH L. GILSON

the Company, which even Mr. Munroe himself hasn't known anything about. The fact is that the Norwegian people are very suspicious for all foreign because they have often been burnt, and therefore had I especially in the first time, without telling Mr. Munroe about it, to stand surety with my person for the preparations and purchase, which Mr. Munroe had to do. All sendings, packages, newspapers, letters, etc., have I gathered here and forwarded further, as the mail is not going to Spitsbergen; and all inquiries from the relations of the working people, who have worked for the Company on Spitsbergen, have I answered and given advices. I have had a particular compartment in my business, belonging to the Arctic Coal Company, and have also had some money disbursed for the Company. My expenses for 1905 have I got repayed from Mr. Munroe, but my expenses for 1906 haven't I got yet, as Mr. Munroe had not money enough when he left here. This amount is Kr. 458,24, on which I have appendixes, and some mailporto, telefon, etc., which I never have noticed.

"I had really expected that the annual meeting held at Boston the 1st of January, 1907, had allotted me a smaller compensation for my small expenses and work for the Company in 1906; but when this isn't done, I want at all laying claim to it now."

He expressed his opinion in regard to Captain Naess and made several suggestions, which were afterwards adopted. He said:—

"Mr. Munroe send me before he left Norway last year from Tønsberg six checks on the Privatbanken here with his name signed in Blanco, so that I could fill out the amount and draw the money in the bank. I have filled out two of those blanquettes, No. 331 with Kr. 75,00 and No. 332 with Kr. 500,00. The amounts together, Kr. 575.00 have Mr. Naess got. Mr. Naess went to Tønsberg in the middle of January. He has been home a little trip, but is now still in Tønsberg to verify the reparation and restoration of the ship. The other four blanquettes are still lying here unused, and cannot after the death of Mr. Munroe be used any more.

"But if I shall be able to do anything for the Company, shall I have to order the necessary amounts. Kr. 500.00 are due as first rate for timber. Do you know what it cost to restorate the ship? Mr. Naess is a good seaman, but no business man. I don't know if he knows anything about it. I haven't heard anything. Mr. Naess has to engage people and bring the ship here to Trondhjem. The ship must of course be insured, etc.

"My opinion is now, that the Company must hire an office-room here in the town, and engage a girl to keep the books. Her wage will represent ca sixty Kroner a month. Office-room ca fifty Kroner a month, and to this I ought to have for my work Kroner one hundred a month (Kroner twelve hundred a year). But then you might be assured of the company would soon have it again. Only by the purchases would I be able to get the cheapest prices, without any advance or receiving any bribery in form of gratuity or any thing of that kind. I shall assure you, to take care of the Company's interests, just as in Munroe's time."

10. LARGE PURCHASES

Mr. Longyear found that the timber-lists of the lumber for the aërial tramway at Advent Bay were in German, with the dimensions given in accordance with the metric system. He tried three different licensed translators, but none of them was able to grapple with the technical terms. Accordingly he used his own American common sense, and, by the aid of the drawings, made out lists covering six sheets of large letter-paper, and then with a tape measure fifty feet long, with meters and centimeters on one side, and feet and inches on the other side, he found the dimensions as given in the German specifications, and was able to interpret it in the more familiar measure. During this rather complicated technical work he was interrupted by numerous calls from trades people, timbermen, and persons desiring to get employment.

Business Details. The next day—April 4—he engaged room in a warehouse on the quay, and an office-room in a

business building, and had it suitably furnished. He set the Company's lawyer to work drawing up and printing the contract-forms to be used in hiring men. Then after buying a Norsk-Engelsk and Engelsk-Norsk dictionary he wrote out his timber-list in Norsk, merely getting Captain Naess to put on the proper terminations for plurals, for verbs, and for adjectives, when he had them wrong. By eleven o'clock at night they were ready for use, and the next day he drove up into the mountains south of Trondhjem to interview the timberman at Klaebø on the bluffs high above the River Nid, which empties into the fjord at Trondhjem.

Mr. Longyear was greatly pleased with the sterling honesty of the timbermen, seemingly less anxious to secure a large order than they were lest they should not be able to fill it. He discovered that the Norwegian foot was three-eighths of an inch longer than the English foot, but although he had taken such pains to translate the German measurements he told these men that they might use the Norse scale, as it would only make the timber-sizes a little larger than the English scale called for. One timberman and his wife were particularly hospitable, and served an abundant, well-cooked dinner. This couple had twelve children—a patriarchal family. They lived in a clean, comfortable, log house, dated 1857. The logs were flattened and planed on the inside. As he and Captain Naess drove away, all the family came out and waved their hats and handkerchiefs till they were out of sight.

Arrival of Gilson. The next day K. L. Gilson arrived, much to Mr. Longyear's satisfaction; and they set to work without delay looking up and ordering supplies, tools, clothing, furniture and other requisites for the expedition, which now gave promise of being ready to start by May 1. The Americans were interested to notice the way in which business was done in Norway and what kind of tools, goods, and the like were kept there. Mr. Longyear says: "We bought files made in Philadelphia, pumps from New Britain, Connecticut, calipers from Massachusetts, etc. I bought a heavy woolen coat made by the peasants here. It will be warm, but it would

not do on Fifth Avenue—not on Easter Sunday. I could not find a cap in the town that was big enough. I may have to wear a blanket over my head when it gets cold!"

A Variegated Equipment. He was astounded at the number of articles necessary to take with them. All the things for seventy-five or a hundred men and two horses would have to be shipped—everything but fuel, water, air, and stone. They could set nets for fish, and they might kill an occasional reindeer, but all other normal food would have to be transported. There are no peddlars in Spitsbergen to fit a man out with pins, needles and thread. Everything had to be carefully thought out beforehand.

This laborious and exhausting work continued for several days: they got prices on groceries, hardware, salt, dried meats and fish, clothing, guns, bread, hay, tools, and dozens of other things, until it seemed to Mr. Longyear that they had checked off everything in the town.

Saether Engaged as Clerk. On Monday they took possession of their new office and hired a Norwegian clerk named Saether who spoke English, having been seven years in America and served three years in the United States Army. He had been in the Philippines, employed much of the time in the Quarter-master's Department in checking over supplies and doing other clerical work. He had also had experience in a bank in Norway. He was taking care of an invalid brother, their parents being dead. Herre Saether proved to be efficient and his knowledge of the two languages was invaluable. That day they studied plans and estimates as to the amount of cement they should require, and the size of the piles they would use. At a warehouse a man opened for them a barrel of salt beef. Mr. Longyear said he looked as wise as he could, and told the dealer that it seemed very good but he questioned whether it had salt enough in it. He complained to another man that his fishballs had not been satisfactory the preceding year.

Herre Bohne, Captain Naess, Mr. Longyear, and Gilson went to the Trondhjem Preserving Company's plant, and

CARL S. SAETHER

tasted so many canned fishballs, canned meat-balls, peas, herring, puddings, and other preserved foods that they made out a hearty meal. These provisions seemed of remarkably excellent quality.

Measurements of Timber. The old timberman came down from his mountain home, and was given the contract to get out all the timber, square and round, except the boards. They bought a horse and harness, to be delivered when the ship should be ready to sail. There were endless details but they could see that they were making progress. It was slow, however, when it came to ordering lumber, for "in one yard they gave prices by the thousand square feet, as in the United States; in another it was reckoned by the square meter, and in still another boards of different width were offered at so much the lineal foot—Norwegian measure at that. In order to decide what was the best offer the lists had to be figured out on all the three different bases. The charge for dressing lumber was twenty kroner ($5.36) per thousand feet—more than six times as much as it cost at that time in the United States! There seemed to be no machinery for doing that kind of work; the time required in doing it by hand explained the high cost.

A Housework Maid. Captain Naess proposed that they should take "a girl" up to Advent Bay to do the housework at the headquarters-house. Mr. Longyear was scandalized at assuming the responsibility for such a combination—one girl among seventy-five or a hundred men! But the Captain exclaimed: "Ho-o-o-oh! She is forty-five yaarr ol' an' no fool." So they interviewed her the next day, and came to the conclusion that she would be safe. They engaged her to go up to Spitsbergen to do all the housework, cooking, washing, and the like, for the four men who would be at the staff-house. They also made arrangements with their "boss" carpenter—a small man, but with a clear, frank eye, and well recommended.

In ordering the supplies of groceries, Mr. Longyear was surprised to find that the Norwegians did not know what corn-starch was: they insisted it must be the same as potato-flour!

The work-people did not care for oatmeal but preferred beans. This was a distinct economy, for beans were far cheaper, and did not require sugar or milk. The Norwegians do not put their sugar into coffee but take small lumps into the mouth and then drink the coffee.

11. NORWEGIAN HOSPITALITY

Sunday, April 14, came as a relief from the burdensome multiplicity of details. Mr. Longyear's diary gives such an interesting account of Norwegian hospitality and country life that a few passages deserve inclusion here. A wholesale grocer and wine-merchant invited him and Mr. Gilson to dinner at two o'clock. While they were at breakfast Herre Bohne, the Norwegian director, came and invited them to take a trip to his countryplace just outside of Trondhjem. Both these men were of German birth but had married Norwegian wives and were "naturalized"; but the Norwegians, like Bostonians of the old stock, never forgive any one for not having been born in Norway, and so they were regarded with suspicion as foreigners. Mr. Longyear writes:—

A Norwegian Countryplace. "We went with Mr. Bohne and at the tramway were met by Mrs. Bohne and their married son and daughter—a mighty good-looking young couple. We rode to the end of the tramway, and then walked on an ascending side hill road for about a mile to the house where Mr. Bohne and his family live in summer. We found an attractive 'layout' of two houses, stables, and outbuildings, arranged around a graveled court, perched on the side hill overlooking the city of Trondhjem, and a mile or two of the valley of the River Nid. An orchard of cherry and apple trees, with small fruits, vegetable garden, flower beds, a rockery, etc., gave us an idea of what the place must be in summer. The interior of the house was cosy and comfortable. Incidentally we saw the work-cart that we have bought of Mr. Bohne to use on Spitsbergen.

"We played a game much in vogue in Norway. It is a combination of quoits and bowling. Two sticks about five

inches by four, oval, and sixteen inches long, with square ends are set up about fifty feet apart. Each player has flat iron disks about five inches in diameter, and a half-inch thick. He pitches them at one stake while he stands by the other. If the quoit hits the stake above the center without first touching the ground, and knocks it over, it counts twenty. If it hits the ground first and knocks it over at all, it counts ten. If no one of the players, playing from one end knocks the stake over, the quoit lying nearest the stake counts five. The game is one hundred. One player of each pair plays from opposite stakes. It is a good outdoor game.

"Miss Bohne and her fiancé, a wholesome, fine-looking couple, came soon after we arrived. After playing the game, wine was served on a marble table in the courtyard, and we sat and talked in the sun until it was time to go."

Wine-Drinking Customs. The Americans were rather appalled at the wine-drinking habits of the Norwegians. They went to the dinner at the hour set, and were warmly welcomed by the family, which consisted of the father, who was a widower, his married daughter with her two little girls, and her husband, and a younger son of the house. The host remarked at dinner that he did not approve of water as a beverage, and thought it was very bad for the stomach. He proved his convictions by the variety of wines served at the dinner:—

"There was Rhine wine with the fish, claret with the meat, Burgundy with the dessert. An hour or so after dinner, as I was planning a retreat, coffee was served, and with it cognac. Then about an hour later, as I was again contemplating the propriety of getting away, fruit was served with old Madeira. I don't care four cents for all the wine, etc., ever made, but I didn't know what was expected of a Norwegian guest, so I 'stood up to the rack' each time and took my share. But I suppose, being served by an expert and mixed judiciously with eatables, I had no difficulty with it although it was more 'booze' than I had surrounded in five years! Our host began to talk of taking a walk and coming back to supper, but I pleaded letters to write, and we came away about seven o'clock

in the evening. Altogether it was a pleasant but mildly anxious experience.

Norse Thrift. "Our host is the owner of the North Cape, and the tourist-pavilion, and his champagne is used there. He told us that it was too expensive to keep the people there to sell anything but champagne, and he showed us the glasses that the champagne companies furnish him with—five hundred of them each year, with his name, etc., and a picture of the North Cape cut in the sides. 'But,' he said, 'they are too small. With these glasses a party of four or six buy one bottle. I shall have them made larger; then they will buy two bottles!' Talk about Yankee schemes! They are not in it!"

Birthday Labors. By an interesting coincidence the next day was the birthday of both Mr. Longyear and Mr. Gilson, and they celebrated it by working harder than ever on the specifications for groceries, meats, and other provisions. The weather contributed a lively snowstorm. Mr. Longyear generously notes that Gilson worked harder than he himself did. In a letter to the home office he remarks that Gilson "is getting into the work in good shape," and adds that their labors were considerably lightened because "Munroe has educated the trades-people here as to what and how we want things." Their new clerk by reason of his acquaintance with both Norwegian and English was helping them "escape some of the troubles Munroe had by reason of the men's not understanding well what was said in English."

On the 18th Mr. Longyear was greatly pleased to get a letter from Mrs. Munroe informing him that she was feeling better, and was ready to take up work in the Trondhjem office, and that she would be there on the following Monday. By this time the large part of the purchases had been made, and Mr. Longyear noted in his diary that it had been many years since he had awakened in the morning "with the feeling of nothing to do," but he did not like it and was glad that there would be only a few days of it. He was interested to see the activity at the bank—one of six or seven in town—signifying that the fishing-season was about to open. This particular one

did a yearly business of a million and a half kroner with the fishermen.

Fickle April Weather. The weather was very puzzling; at one moment there would be bright warm sunshine; then there would be a brisk snowsquall. On the 19th Mr. Longyear and Gilson went out to hear the band play. "We stood in the bright warm sunshine all the time, and walked back to the office enjoying the warmth. I went up one flight of stairs, entered the office, hung up my coat and hat, and looked out of the window to see it snowing hard."

In the afternoon a traveling salesman from Kristiania arrived, and they ordered clothing for their workmen. The prices seemed remarkable reasonable: "Heavy wool trousers four kroner and less;"—from ninety-five cents to one dollar and eight cents—and other articles in proportion.

"The Merry Widow." In the evening they went to see "Den Glad Enke"—which was an opera known to English fame as "The Merry Widow." The little theater had for seats a sort of combination-bench with back, and individual folding-seats. It was packed to the doors—every seat and every inch of standing-room being occupied by a soberly-dressed and sedate crowd. The singing seemed to be very good; the dancing was mostly in Hungarian style. "The dance that roused the most enthusiasm was by men, and was something on the cakewalk order."

On Sunday they walked to the old fortress, Kirstensten, that looks down on the town, and enjoyed the fine panoramic view over the valley of the river, the distant fjord, and the contrasting red tiles and black slate roofs of the older and newer houses. They also visited the cathedral, which had been for some years in the sacrilegious hands of "restorers." Mr. Longyear could not see that a very great amount of work had been accomplished since he saw it four years before.

Social Amenities. They again dined with the host of the Sunday preceding, and were again given the opportunity to sample various wines, but the host, recognizing his guests' prejudices, had this time provided a magnificent crystal pitcher

filled with crystal water. After dinner cards were produced, and "whist as she is played in Norway" was the order of the afternoon. At six o'clock Mr. Longyear made a move to go, but the others had only just got into the spirit of it. Mr. Longyear describes the evening most entertainingly:—"After another hour or so I saw the supper-table being set and I was mighty uneasy. At the end of a game I again moved to go, and the host said: 'Oh, you can't go now; supper is just ready, and if you go I shall think you didn't like your dinner.' " There was more whist à la Norge till half after eleven. Mr. Longyear continues:—

"All the time on the card table Madeira wine was served, and our host, at frequent intervals, would lift his glass and say, 'Good health!' " and empty his glass. Gilson and I, grown crafty, would sip a drop for each 'good health' and so got along with an infinitesimal amount. Now, this sounds like a giddy drinking-orgy but it was not. These people are all 'grave and reverend seigneurs' of the Community—Church members, and live quiet humdrum lives. Our host's wife died suddenly about two months ago, and he told us that he felt very grateful to his friends who would come in and pass the time with him on Sunday. They would probably receive with incredulous surprise any intimation that these good Lutherans were not living the most sedate and proper lives possible. And who shall say they are not? Not I, but I do not want to live in the same way."

Early the next morning Mr. Longyear met Mrs. Munroe at the train from Kristiania, and spent most of the day in going over Spitsbergen matters with her, and "found her knowledge of things there of much help."

12. LUMBER DEALINGS

One of the results was that they ordered several thousand feet of lumber extra for their large structures and for the aërial tramway. He had supposed it was already on the ground. It was very fortunate that they discovered this omission in time, for a serious delay would have been caused had

TRONDHJEM CATHEDRAL

they reached Advent Bay without it. Their timberman had been employing twenty men and three horses in getting out the specifications already ordered.

It was a puzzle what to order in addition in case they could not get the sizes specified by the German engineers. There was to be a shed connected with the main structure, but a note at the bottom of the timber list stated that the timber for the shed was not on the list. The object of the shed seemed to keep storm and dust from the machinery, which was to stand on heavy cemented piers, but the drawings showed it to be built of heavy timbers.

They also engaged a steward who was to bring along a cook. Mrs. Munroe made many excellent suggestions as to the table-ware, and other articles needed on the island.

Herre Bohne's Reward. On the 24th Mr. Longyear chronicles a pleasant and rather unusual experience. Herre Bohne, who, as we have seen, was one of the original stockholders in the Trondhjem-Spitsbergen Kulkompagni, and had rendered many services to the new Corporation by advancing money and looking after their interests, had been asked to make out a statement regarding the Arctic Coal Company's indebtedness to him. He brought in one showing a balance due him 987.78 kroner. The Boston office, wishing to show a fitting appreciation of his good will suggested to Mr. Longyear to send him a substantial check, and accordingly he intrusted Mr. Gilson with the pleasant duty of presenting him two thousand kroner—about five hundred and forty dollars. Herre Bohne immediately came to see Mr. Longyear and protested that he really could not accept such munificence for the little that he had done. He did not want to offend his benefactors, but he asked Mr. Longyear to reduce it to fifteen hundred kroner. Mr. Longyear, who had considerable difficulty in persuading him that the company would not take it amiss, thought that he showed a fine spirit.

The Americans found it rather difficult to get accustomed to Norwegian meal-hours. The usual breakfast-time at Trondhjem was nine o'clock. Dinner was served at two and

supper at eight. Most offices were kept open until that time; but no business was transacted between twelve and one, and but little between twelve and four. Gilson managed to get an hour or two of work accomplished before breakfast, which he and Mr. Longyear took at half-past eight.

The Meaning of "Work." They had a good deal of difficulty with the work-people, and came to the conclusion that work had a subjective meaning: the men were trying to "work" the strangers. They were in the habit of coming in twos, and putting in demands for advance pay for time spent in various questionable ways. Their old timberman appeared, and when he was asked how he was getting along replied that the good Lord had arranged a late spring so that he would be able to get out the timber without interfering with his farm work! They hired a cook's boy on the strength of his smile—which "was about a mile wide." Mr. Longyear noted that his was the only smiling face they had seen among those seeking work with them. He was a lad of sixteen.

Gilson asked him how he was going to get on for the next fourteen days, and he said he would get on all right. He also replied to a question that he had eight øre (about two cents), and he expressed a smiling confidence in being able to make that do with what he could pick up. He left the office with a little more than eight øre, and a promise of a job "if he still wanted to go when we were ready."

Friday, April 26, was another of the Lutheran Church holidays, and Herre Horberg, one of the stockholders, who had been active in securing workmen for them, took them for a drive to the falls of the River Nid, about five miles above the town. They found that the snow was still two feet deep in the woods, and in many places along the road. There were many gravel-bars visible in the river, showing that the snow had not begun to melt to any appreciable extent. At the hotel the effect of the holiday was shown in a "pick-up dinner;" many of the waiters were absent. Mr. Longyear thought it was no wonder the country was poor, "they have so many days when a man can not work even if he wants to."

A Trondhjem Whist Party. Herre Solen, local agent for the Cunard Steamship, invited the three Americans to coffee at five, and there they found a large party of relatives and friends. The "coffee" proved to be a regular meal, and it was followed by whist. They had to stay to supper which was served at nine-thirty. Mr. Longyear's diary gives an interesting account of the customs of the Norwegians:—

"The men seem to go first into the dining-room, although that is perhaps not a custom for often they do not do so. The hostess does not sit at able, but assists in serving the guests. In leaving the table guests shake hands with the host, or bow to him, and thank him for the entertainment. When you take your leave host and hostess thank you for having come to see them. . . . During the evening a young woman came in and sat down at the piano and began to play. She was not introduced to any one, and no one paid the slightest attention to her or to her playing. She clattered away, and every one went on talking and smoking, as if there were no piano in the room. After a while the young woman disappeared, and we saw and heard no more of her."

The host lived on the second floor above his office. In the office was a sample set of steerage-bunks, while the back part of the building was used as a hotel where their third-class passengers were "put up" while waiting for a ship. The rooms were adorned with many portraits of American Presidents, views of sky-scrapers, and other scenes of life in the United States.

13. THE NEW SHIP

A telegram came from Captain Naess stating that the *William D. Munroe,* as they had decided to name the new ship, would not be ready to leave Tønsberg before May 10. It had been promised by the 1st.

This was only another instance of the "inertia of the Norwegians." Another difficulty arose when the labor-foreman announced that he would not go with them unless the Company insured the laborers. He was out of town, and they replied

by mail that they had no intention of doing any such thing, and that if he was sincere in his refusal to go he would be left behind! It seemed to be an endless job to get a proper crew together.

As Gilson was taking hold well, and Mrs. Munroe was there to look after things in her way, Mr. Longyear went by night train to Kristiania, and reached Tønsberg in just twenty-four hours. The effect of his peremptory telegrams and of his promised arrival had made the manager of the shipyard a little more alert and anxious. Mr. Longyear notes: "I will try to keep him anxious." He had evidently got a few extra hands at work. When he visited the ship the next morning he realized the true inwardness of Norwegian dilatoriness. For instance, he saw two carpenters cutting eight-inch round holes through three-inch deck planks with chisels and wasting hours at it, when a scroll saw would have accomplished the work in ten minutes.

"Two carpenters worked for six or seven hours making a piece of oak moulding, two by three inches and fifteen feet long. They hewed it out of a plank seven inches wide and two and a half inches thick. There were plenty of two-inch planks, so I can not imagine why they took one a half inch thicker than necessary, unless it was to make more work. A rip-saw and a two-inch plank should have enabled one man to make it in an hour or two.

"Four men worked all the forenoon scraping the old paint off from the smokestack, and it was not done when I came away for dinner at two."

When he returned to the ship he was rejoiced to see a thick coat of red paint on the smokestack. He had not the heart to blame the poor chaps for not showing much enthusiasm over work that paid them only about three kroner—eighty-one cents—for a ten-hour day. He thought the shipyard deficient in facilities for doing efficient work. The little machinery they had was crude and antiquated. Even the riveting of boilers, and other steel construction, was done by hand. Nearly all the tools used by the Norwegian car-

penters were astonishingly crude and antiquated. Most of them had in their kit a handsaw made with a thin, narrow blade, mounted like a big bucksaw. Their enormous hammers consist of a square section of steel bar cut off, with a hole perforated for the handle, and with one end split and flattened for the claw, and the other serving as the head.

Mr. Longyear noticed that they put in an excessive amount of mouldings. He says:—"A part of the repairs on the ship was made in the cabin, the walls of which were laid out in panels. The bunks or bench running around the side of the room were also paneled. All that was really required would have been flat strips of wood nailed over the wooden basis." But the Norwegian carpenters spent days in fitting mouldings to the panels, some of them made of two or three pieces, mitered at the corners. It was an exasperating waste of time and money. One carpenter who was using an adz to work down a two-inch plank told him he had recently returned from America because he could not get work there. Mr. Longyear, knowing that skilled carpenters were scarce in the States, was surprised—until he saw how he worked! He saw a blacksmith consume an hour making a simple iron object that should have been finished in fifteen minutes.

Vexatious Hindrances. Drizzling rains hindered the painting of the outside of the ship: Nature seemed to conspire with Norwegian inefficiency in delaying the "reparation" of the ship. But Mr. Longyear was determined not to allow this contretemps to affect the sailing of the *Munroe*. He decided to take a painter and a carpenter to Trondhjem and let them finish the work there while the cargo was loading.

Another difficulty arose when the man of whom they expected to buy coal for the voyage reported that he had none, and would not have any until after they expected to leave. Fortunately, however, there was sufficient on board to drive the ship to some place where it could be obtained.

Then on Saturday, May 4, a schooner arrived with a load of coal, and they found they could buy what they needed at seventeen or eighteen kroner a ton—three or four kroner

cheaper than the general dealers asked. Some of the crew also appeared and matters looked brighter.

The painters worked two days—one a holiday—and at half after five in the afternoon of the 6th the *Munroe* was warped across the harbor to the coal schooner to get the bunkers filled. The captain of the schooner seeing this operation naturally supposed that they had not enough to come by their own power and coolly informed them that the men would not work after six P. M. without extra pay, and that they must pay the duty on the coal in addition to the price asked. This little scheme did not result as the captain expected. He was informed that they would wait until morning and then see. In the evening they had a conference with the shipyard superintendent, and he agreed to let them have what coal they needed temporarily at half a krone less than the grasping schooner-captain had demanded of them.

Mr. Longyear bought in Kristiania a considerable number of English books and magazines to be taken to Spitsbergen. They ranged from novels to religious treatises. The Consul-general gave him also a quantity of papers in their original wrappers, and seēmed glad to get rid of them.

Herre Anker and His Agent. Herre Anker, hearing that he was in the city, manifested great eagerness to see him but the meeting did not come off. He lunched with Anker's agent, Lundt, however, and "filled him full of figures as to trade in the United States," but was impervious to various tempting proposals to embark with Anker in mining. Perhaps this wise resistance was somewhat confirmed by a bill pending in the Storthing providing that concessions should be granted to foreigners only on condition that one-third of the stock-holders and all the agents and workmen should be natives, and that any such company should pay a considerable royalty to the State.

14. DIFFICULTY OF REGISTRATION

A difficult problem arose in regard to the registry of the *William D. Munroe*. It had been bought of a Danish owner,

and had last sailed under the flag of Denmark and name of *Heimdal,* though it was built in Norway in 1872. It was now owned by Americans; yet there was no way by which a foreign-built vessel could obtain American registry. Under certain conditions it was possible for a native of the United States temporarily to register a foreign-built pleasure-yacht in America, but if it should be discovered that such a vessel was used in commerce its registration would be void. It would not be allowed to visit an American port and it would be liable to confiscation.

Obviating Technicalities. The Boston office suggested that as the secretary of the Arctic Coal Company, Mr. W. F. Bentinck-Smith, was an English citizen, the vessel might be registered under his name in England, and that Mr. Longyear, armed with a power of attorney of wide scope, might obtain from the British Consul at Trondhjem a temporary registration, under which it might traffic between Norway and Spitsbergen, proceeding to England at the end of the season and securing permanent papers. The trouble with English registration was that there would be high harbor and pilot dues, and endless difficulties in trading from port to port in Norway.

By the advice of Mr. H. Bordewith, the United States Consul-General at Kristiania, Mr. Longyear went to see Herre Magnus Andersen, Chief Minister of the Norwegian Merchant Marine. He had been Commander of the Viking ship which crossed the Atlantic and sailed up to Chicago at the time of the Columbian Exposition in 1893, and was friendly-disposed. Recognizing that as foreigners Mr. Longyear's Company could not obtain Norwegian registration, Herre Andersen suggested forming an auxiliary company in which one or more Norwegians might be the incorporators. This seemed an easy way out of the difficulty.

An Auxiliary Company. When Mr. Longyear reached Trondhjem again on Thursday, May 9, he found all business at a standstill: it was another Church holiday; but on Friday he proceeded to form the new company which was to bear the name of the "William D. Munroe Aktieselskab." His lawyer

had only a limited command of English, and after half an hour's talk still supposed that it was merely a question of some insurance papers. At last, however, the plan for the new corporation was satisfactorily drawn up. Each of the Norwegian stockholders of the Arctic Coal Company was to hold one share, and the company itself the remainder; a conveyance of the vessel to its new holders was arranged. Then a meeting of the Norwegians was called, and though all the details might have been settled in a few minutes, the Norwegians were not to be deprived of their great pleasure in discussion and a lot of time was consumed in forming the ship company.

Arrival of the Munroe. That evening after supper Mr. Longyear, Gilson, and Mrs. Munroe, walked down to the harbor front to see if there was any sign of the vessel's arrival. Sure enough: it was already in: they could see the "crow's-nest" above the sheds on the dock. Mrs. Munroe had not been told that the name of the ship had been changed from *Heimdal* to *William D. Munroe,* and she thought the flag with the name on it was too long; but when she read the name on the bow she was greatly delighted and touched. Captain Naess showed them all over the vessel, and told them how, as they were about to weigh anchor and sail from Tønsberg, a line had parted and anchor and chain went to the bottom. A diver worked several hours before he located it, and then it had to be hoisted on board.

Before the *Munroe* could take on her cargo the Customs officers had to give her a thorough measurement. Their wages up to six o'clock were paid by the Government but extra work was to be paid for by the Company at the rate of one krone and a quarter per hour for each surveyor. The four men were ordered to keep at it until it was finished if it took all night, but they got it done at eleven o'clock.

At six the next morning began the work of stowing away the innumerable boxes, barrels, and other freight with which the dock was overflowing. It was hoped that the Customs authorities would allow the ship to make her first trip without

waiting for the more formal papers. But all this nicely formulated plan was upset when they learned that a newly promulgated law forbade any vessel which rated less than A2 in the Norwegian Veritas inspection from coming under the Norwegian flag. The ship had been examined the year before and was rated B1, equivalent to the English Lloyd's rating of A2. Mr. Longyear called up Herre Andersen at Kristiania by long distance telephone, and tried to make him see that as they had expended twenty thousand kroner on repairs—had put on a heavy outside sheathing of two and a half inch oak planking to protect the original planking, which was of extraordinary thickness while the ribs were only one or two inches apart, and the repairers had found the vessel perfectly sound, it ought to be raised to the higher rating. This Herre Andersen refused to consider unless it were first subjected to a thorough dry dock examination. That would have taken a fortnight, and even then the higher rating might not have been granted. So the corporation papers were recalled by telegraph before they had reached the Government Bureau in Kristiania where they had been sent.

They then tried what could be done through the British Consul at Trondhjem, and he took the matter up with the British Minister at Kristiania. Here again they received cold comfort. As the vessel had no sailing port in England, and as their captain and first engineer had no English papers, there was no hope of an English rating.

Cutting the Gordian Knot of Red Tape. Now there were forty men in their employ in Spitsbergen from whom no word had been received since the first of the preceding October: Mr. Longyear decided that his first duty, whatever the consequences might be, was to get to them without further delay. At Tønsberg he had caused the name of the *Munroe's* sailing port to be painted as Boston under its new name on the stern. When the auxiliary company was formed he had Boston painted out and Trondhjem substituted; he now restored the name of Boston.

On Monday, the 13th, a mob of the men who had been

engaged to go to Spitsbergen, besieged the office to get what they called "foreskoot" (*forskud*) or advance on account of wages. That seems to have been a universal custom in Norway. It was a particularly obnoxious imposition. A good many of the men, when once they had laid their hands on the advance would proceed to spend it in getting intoxicated and not show up again. In this case the men were compelled to put up security or produce some responsible person to guarantee what was paid to them. Quarters for the men—about fifty in number—were prepared in the fore part of the ship, and it was decided to sail as promptly as possible, clearing simply as an American-owned craft, and in the autumn make arrangements to get a "Veritas" examination and an A1 rating if possible.

Box Furniture. Among those who were booked to sail on the *Munroe* were Herr Baever, sent by the Bleichert Company of Leipzig to erect the aërial tram at Advent Bay, and Miss Louise Brigham, a friend of Mrs. Munroe's. Miss Brigham was a settlement-worker, and teacher of handicrafts. She had visited Spitsbergen the year before, and had accomplished wonders in furnishing the superintendent's house with furniture which she made of packing-boxes and other wooden material. She had expected to continue her labors there this summer but the death of Munroe had upset her plans. She was preparing a book to be published by the Scribners of New York under the title of "Box Furniture." Mrs. Munroe told Mr. Longyear that Miss Brigham's great desire was to go to Spitsbergen, and finish the work she had begun the year before. Mr. Longyear sent word to her that she was welcome to go as his guest, if she had the "nerve" to undertake it, and her arrival gave proof that she had.

A Parting Punsch. The afternoon before the expedition was to sail the Norwegian stockholders were invited to come on board the vessel, and Mr. Longyear explained to them what it was planned to do at Spitsbergen. There was a spread of coffee, cakes, and a mild *punsch,* which Mr. Longyear, finding that some kind of strong drink was indispensable, felt obliged

to furnish, but he was glad to see that about a quarter of the guests did not touch the *punsch* and those that partook of it consumed only about half a bottle in all, and every one went home sober.

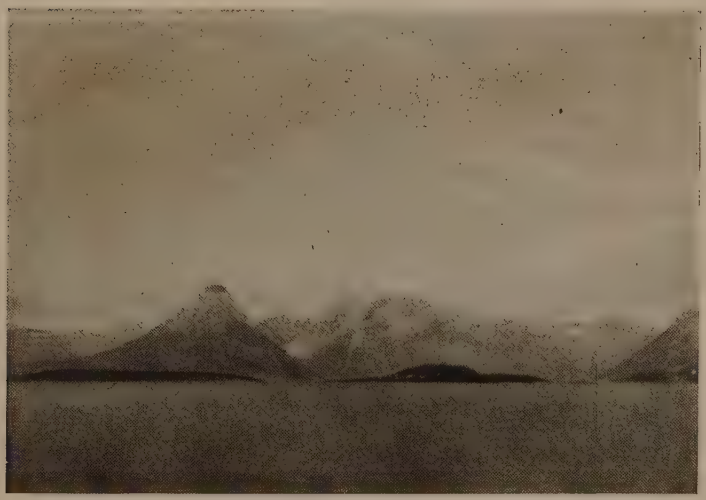
IV. A FAIR BEGINNING

1. THE TRIP UP

ALL THE final preparations were completed on May 16. Almost at the last moment word came that the insurance companies with one accord had refused to issue any policies on the ship. The truth was that a voyage to Spitsbergen, though regarded as a sort of vagabond and desperate adventure, was in reality far less dangerous than traveling along the coast of Norway with its thousands of islands, reefs, and promontories. They were compelled to go without insurance, but they had the consolation of knowing that they were saving quite excessive cost. They had no trouble, however, about getting clearance-papers from the custom house and harbor officers.

All the men engaged were notified to be aboard on the evening of that day, because May 17 is the anniversary of the Adoption of the Constitution of Norway, and is a national holiday, corresponding to the Fourth of July in the United States. It was realized that if the Norwegian laborers were not safe on board, it might be several days before they could be rounded up and sobered off. By midnight they were all accounted for, though several of them "had to be hauled on board like sacks of potatoes."

FRIENDLY ATTENTIONS. Mr. Longyear, Herr Baever, Mr. Gilson and Miss Brigham, after eating their supper at the Grand Hotel, went to the ship, with bag and baggage. They found their quarters transformed into a fairy bower: Herre Holte, the hotel keeper, had sent a blooming hydrangea in a pot; Herre Bohne sent a plant with big red and white flowers in a pot, and a budded rose-bush in a pot, and there were ivy vines already started for Miss Brigham to adorn the Spits-



A SEAL-HUNTER'S SLOOP

COAST OF NORWAY AT THE ARCTIC CIRCLE

bergen house. The cabins, the Captain's room, and the dining-room "looked like green-houses." They all thought it was a very delicate and friendly attention on the part of their Norwegian acquaintances.

Drunken Officers. At midnight it was discovered that the second engineer was missing. They could not go without him, but the captain, cut loose from the dock, ran the ship out into the harbor and cast anchor, so that no one else could get to the saloons. The police were notified, and the missing engineer was finally located in the lock-up, hopelessly drunk from having begun to celebrate in anticipation of the holiday. Nothing could be done to effect his release until the morning. He was then brought on board.

The first mate had also absorbed a little too much of the spirit of independence, though at first he seemed to carry it pretty well. But soon after midnight he got into an altercation with Captain Naess who ordered him to his bunk. He refused to go, and the captain undertook to put him off the deck. In doing so he somehow received a serious injury to his right hand, and was obliged to ask some of the crew to take the mate and put him into his bunk.

The next day the mate, sober and in his right mind, went to the captain and with many tears of repentance vowed he would never take another drink of intoxicating liquor as long as he lived. Mr. Longyear thought it remarkable that the captain bore no grudge against him, although his hand was so badly hurt that he had to carry it in a sling for weeks, and pieces of the broken bone came out. He had to exercise great care in examining such men as visited the shore as well as their packages. It was contrary to the regulations to indulge in alcoholic beverages, and any employee of the company who smuggled liquor aboard the ship or into the camp knew that he was liable to be discharged without possibility of being re-employed. Mr. Longyear wrote home:

"The average Scandinavian seems to have no power of resistance against temptation. And they say they have had Christianity for nearly a thousand years!"

An Impressive Start. Half an hour after the missing engineer was got aboard, the anchor was weighed, and the expedition was off at last. As they ran down the harbor front just outside the breakwater, the flags were dipped three times and the whistle was blown in farewell salutation. The Norwegian flag flew from the foremast; the burgee, bearing the name of the vessel streamed out from the mainmast; the Company's flag, with a white bear on a blue field, adorned the mizzen mast, and Old Glory waved from the flagstaff on the stern. This made Mr. Longyear a little apprehensive lest it might lead to his arrest on his return, and possibly bring about the confiscation of the ship.

Wellman's air-ship expedition, which was to attempt to reach the North Pole from Spitsbergen, had just finished its outfit at Tromsø, and started on its voyage to the Arctic only a few hours earlier. After leaving Trondhjem the bunting was taken in but they met a good many steamers and sailing-vessels all gay with flags, and people could be seen examining the stranger craft that sailed without decorating in honor of the national holiday.

Gilson and Saether made out the roster of the men they had hired, and found that not one of those to whom they had made advances of payment was missing. There were fifty in all—a considerable number of them being carpenters to be employed during the summer in putting up the wooden constructions. The stock of goods was opened up and mattresses, blankets, and clothing were sold to those that lacked them, it being the custom for laborers in Norway to furnish and own their bedding and the like. Mr. Longyear was interested to see Gilson, who had been up almost all night, engaged in dressing a bad finger for one of the men. As the box containing bandages was not at hand he tore up one of his old shirts and made an extempore bandage.

Outside there was a heavy sea running, but the ship kept its course through the quiet waters behind the belt of islands which protects the coast of Norway, just as the northwestern coast of America up to Alaska has its sheltered sea-lane. The

weather was clear, and they had wonderful views of the scenery, every point of which is rich in myths and legends.

They saw the natural tunnel through the mountain island called Torghatten. It was said that an envious giant threw a stone at Torge's sweetheart from Rødløven or the Red Lion a hundred miles farther north and it went through Torge's hat. Some views of the island show it to be shaped like a hat.

About noon the next day they passed Finknaesfjeld, a mountain four thousand, three hundred feet high and covered with snow, and then the Seven Sisters—a range of snowy peaks on the island of Alsten. After crossing the Arctic Circle they had fine views of Hestmandø (the Horseman), Rødløven (The Red Lion) and the Sleeping Elephant, and other petrified fauna of the Norse imagination. There were hosts of eider ducks which, because it was their nesting season, were exceedingly tame. They seemed to regard the steamer as only a bigger sister, and moved out of the way just far enough to avoid being run down.

At Tromsø Again. Sunday, May 19, was Pentecost Day, and the flags were all out in honor of the festival. They were running through the Vestfjord and innumerable jagged peaks, glittering white in the clear bright sun, surrounded them on all sides. The air was so clear that it seemed almost as if one could touch them, and yet there was twenty miles of sea-room They reached Tromsø at half past one in the morning. It happened that there had been a great ball there, and everyone was up and drinking coffee. Tromsø was Captain Naess's birthplace, and his family lived there. Mr. Longyear met the captain's brother and fiancée, and when the captain, whose hand was in pretty bad condition and required to be lanced and bandaged at the hospital, was ordered to remain quiet for a few days, his uncle was engaged to act as pilot in case the ship got into difficulties in the ice pack. He had enjoyed forty-seven years of experience in Arctic navigation, and had served the Prince of Monaco in a similar capacity. He wore gold ear-rings, and seemed to be a fine speciment of a Spitsbergen Viking.

As usual at Tromsø the Lapps came down to show themselves. One family was in a sort of shed, with their dogs and dunnage all about them. When they saw the kodaks leveled at them they began to dodge, but Mr. Longyear held up a krone and that had a magic effect; at the command of their headman they posed without further ado. But the old man refused to take the coin. It was offered in turn to all the men of the group but they refused it. Finally a woman put out her hand and took it. Then the man said, "Tak!" which is Norwegian for "Thanks." In explanation of the strange reluctance of the old man to accept the money, Captain Naess said that probably he owned several thousand reindeer, and was a great nabob among his people, and it would have been beneath his dignity to take so small a fee! These Lapps had shrewd, intelligent faces. They belonged to a colony "two days" from Tromsø, and were of a better class than the nomad Lapps ordinarily seen by tourists, who were still off on their winter trip to northwest Russia, where food for the reindeer is more available than in Norway, though in summer the Norwegian moss is better than it is in Russia.

The weather continued fine, and as they sailed through the Grøt Sund and Fuglø Sund the mountains for a distance of sixty miles, rising to a height of from three thousand to fifty-six hundred feet, and covered with spotless snow, were brilliantly reflected in the mirror-like green water which was dotted with countless thousands of birds, gathering for their breeding season on Fuglø (Bird Island), with its miles of vertical cliffs exposed on three sides to the Arctic Ocean.

The passengers were greatly amused in watching their ludicrous antics as they suddenly awoke to the approach of the steamer and scampered out of her way.

2. IN THE ARCTIC OCEAN

At seven in the evening of Monday, May 20, the ship, leaving Fuglø behind her, sailed out into the Arctic Ocean, and into what the hymn calls "sacred high eternal noon." The horse evidently disliked this disruption of the calendar, and

MOORING THE SHIP TO THE SOLID ICE

THE "MUNROE" PASSING THRU FIELDS OF ICE

was not a good sailor; he tried to get out of his stall. He broke the ropes which held his head, and it required the efforts of four men to restrain him while the sailors lashed an inch rope over and around his stall. Then finding that Fate was too much for him he lay down in a heap, and as it was found that his legs were properly disposed under him, he was left alone; a few hours later he got up, and began to eat his hay with equanimity. After that a man was kept on guard over him to attend to all his wants, and help him if he needed attention or consolation.

The Søhest. Outside the ship the only living things visible were the birds: a new variety appeared, called by the Norwegians "Sea-horses" (Fulmars). They looked like gulls, but were stouter and with straighter wings. They sailed over the water within a foot or two of the surface, rising and falling with the waves, with scarcely a motion of the wings. A gull picked up a string about a yard long with pieces of meat tied on the ends and the whole flock pursued him, grabbing it from one another as they followed the ship. This game they kept up for several hours, and afforded endless amusement to the passengers. In the morning the wind was from the southwest; then it veered to west, northwest, and north. The pilot remarked, "north wind better; west wind packs ice against Spitsbergen; north wind scatters it."

Beautiful Ice-forms. The next day was fair though cloudy; the wind blew keen and cold from the north, and they had sight of ice which was in the form of a pack with open lanes crossing it. They had to run a considerable distance to the westward to avoid it. The floes were worn and washed into a great variety of forms, beautiful, strange, and often grotesque, resembling animals, birds, grottoes, and the like, in endless processions as they steamed along close to the pack. The Norwegians were expert in judging by the appearance of the sky where they should find open water. The Captain augured well by the heavy swell from the northwest, because in the lee of the ice there would be little or no motion of the water.

Just after dinner they saw seven seal-hunting sloops sailing along the south side of the ice-pack, and a Greenland seal was playing in the water near one of them. No attempt is made to kill seals except when they are on the ice, as they sink if wounded. About six o'clock in the afternoon a field of ice appeared off to starboard with large icebergs which were so high that they looked like hills on land.

Ice Floes. On the morning of Thursday, the 23rd, they saw the white peaks of Spitsbergen near South Cape, but a vast field of ice, of a wonderful blue color, obliged the captain to run off from their course for several hours. There was a peculiar ghostly yellow light on the distant mountains. Every once in a while the ship would bump into huge cakes of ice, and the mate stayed up in the crows-nest on the lookout for available passes between the bergs. There were many seals swimming about or lying on the pack.

About two in the afternoon they reached a field of what seemed like solid ice stretching to the west as far as the eye could see; but the watchman reported that the sea was free of ice half a mile or so ahead; they drove into it, following leads of open water where there were any, and by ramming aside the bergs with the solid oak and iron prow, they finally reached the other side of the pack and had a fine run all the rest of the day. A gentle swell proved that they would not be troubled with any more obstruction for some time. Snow was falling and it was bitter cold.

A Big Seal. Shortly before dinner was served a large Greenland seal was observed lying on a berg near their course, and Gilson succeeded in shooting it with the ship's gun. It was brought on board; it measured eight feet and three inches long; the fat under its skin was three inches thick. It was said that seal hunters always make a great noise when they approach a seal on the ice: its curiosity overcomes its discretion; it stops to listen, and the men have the chance of getting nearer, and of killing it. Some of the men hung a baited hook on the end of a long line, and caught a "sea-horse" bird in such a way that it came in backward. While

it was struggling in the water the rest of the flock pounced down on it and killed it.

Lively Sport. The next morning early they reached Ice Fjord, which was full of fields of floating ice. Opposite Coles Bay it was solid. A sailor leaped from the deck to the surface of the ice, and passed a line around a block that stuck up like a post near the edge. Many seals lying on the floating cakes farther out or swimming in the water, were so fearless that they came within less than a hundred yards of the ship. Thousands of Arctic birds were flying all about, and often swooped within a few feet of the deck. The men had great sport in tying pieces of seal blubber to the opposite ends of strings, and watching their antics as they tried to get away with this appetizing food. Several were caught with hooks, and one of the men plucked off the feathers to make a pillow. These, being well supplied with oil, would be likely to exhale a powerful perfume of rancidness.

A school of white whales was seen rolling across the Ice Fjord, and passed the vessel within shooting distance. Gilson tried several shots but missed them. The white of the bodies could be seen in the water some time before they came to the surface as they do every minute or two. With the school was a kindergarten of baby whales: these were black.

3. IN THE ICE

The vessel, thus docked, was about twenty miles from Advent Bay. It was found that skis had been omitted from the equipment; but two of the carpenters got boards from the load, and made a couple of pairs. The weather had cleared, and was "faultlessly beautiful." Then two men on skis, carrying the mail for the men at the camp, and Gilson and Saether without skis, started to make their way across the ice to the mine. As the ice might prove to be treacherous, Gilson carried a spruce board about eight feet long, with his arms hooked over it, for use in case either he or Saether should slip into a hole in the snow. Saether carried a rifle, as it was possible they might come across a Polar bear. Through spyglasses

those on board the *Munroe* could see the four men struggling over the rough ice for more than two hours.

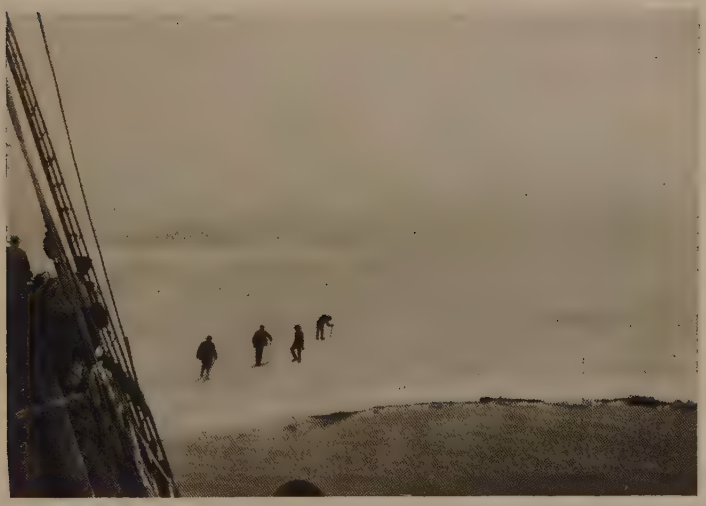
In the Ice Off Spitsbergen. The next day the weather continued bright and cold, the sky blue and cloudless. Occasionally a northwest breeze rippled the mirror-like water which was filled with ice-crystals. Often it was so still that films of ice formed though not solid enough to interfere with the countless birds swimming in it. Water on deck froze into slush or solid cakes.

The captain tried to ram the pack but it was too firm to yield. Then he attached two lines to ice-hummocks, and signaled to the engines to drive full speed ahead, so that the current made by the propeller might wear a channel or else crack the pack a mile or so back. All that was accomplished by these experiments was to consume a lot of coal.

After dinner five more men set out to cross the ice to Advent Bay, and in the middle of the afternoon, Mangham, the English winter superintendent, arrived from the mine in company with the blacksmith. They had made an expedition to Coles Bay on the afternoon after the arrival of the *Munroe* and from the high land back of Coles Bay had examined Ice Fjord with fieldglasses, but somehow missed seeing the ship which was some sixteen miles distant tied up to the ice. On the shore of Coles Bay the Arctic Coal Company had a hut used by hunters and prospectors. After resting there for a while they started back to Advent Bay, and on reaching high ground again took another look, and this time discovered the vessel, and struck across for it, arriving there about the same time as Gilson and his party reached the camp.

4. TROUBLE AT THE ENGLISH CAMP

Mangham had an interesting story of the condition that had obtained in the camp of the English Company during the winter. Ten English and Scotch miners, and about sixty Scandinavians, mostly Swedes, had been left to work the mine. The manager had been an officer in the British Army, and seemed to have treated the Swedes as if they had been



S. S. "MUNROE" MOORED TO THE ICE

GILSON AND SAETHER LEAVING THE SHIP FOR THE CAMP

army raw recruits. Among the supplies left in the autumn had been more than fourteen thousand bottles of beer and other "wet goods"; a bar had been established, and those men that worked spent there all they earned. Some of them became half crazy from drink; a row occurred early in the season and the manager undertook to settle it by appearing among them carrying a gun with which he threatened them. The men took the gun away from him, threw him to the ground, and would probably have killed him had not some of the cooler members of the mob interfered. He escaped to his house, and there kept himself a virtual prisoner, after the approach of continuous daylight, not daring to show himself lest the men would shoot him. Machinery had been broken and, like the men, would not work; water-tanks had been left full so that when ice formed they burst. There had been many brawls and fights.

The manager invited Gilson to come over and dine with him and he was glad to do so, as he thought he might borrow some horses. The manager told his side of the riot, and asked Gilson to deliver to Mr. Longyear a letter which he dared not entrust to any of his own men.

The Scandinavians had announced that when the English Company's vessel arrived in the spring they would seize it, and take every one in the camp back to Norway, where they proposed to hale the manager into court and compel him to pay them their wages for the winter, although they had been on strike all the time and had not worked. It was therefore important that the English ship should not touch the land. The manager in his letter asked Mr. Longyear to go out and meet it when he saw it coming, and deliver certain letters and papers which he enclosed in his letter to some of the directors of the company who would be on board.

Progress at the Mine. Mangham and the blacksmith reported that everything at the American mine was getting along finely. They had enjoyed a prosperous winter and had made good progress: the dock was built, and the timber for the coal-pocket was all framed ready to be erected. The men

were well and contented; Mangham had used his spare time in teaching them English, and many of them could already understand it very well. All the animals—even the pigs—were in prime condition. About five o'clock that afternoon the captain ran the ship across to Safe Harbor, about twelve miles distant, thinking that they might leave their lumber there and then return to Trondhjem for the rest of the equipment. But there also the ice was still solid. They found that by ramming into it they were able to penetrate several hundred yards.

Visits from Sealers and Seals. Two hunters, whose smack had been crushed by the ice, so that they had been obliged to spend the winter on land, came aboard in Safe Harbor and asked passage back to Norway. They had killed eight blue foxes and ten Polar bears.

The Captain next tried to penetrate into Green Harbor but there the same ice-conditions prevailed—with no chance for unloading. On their return they moored against the pack again but about three miles nearer the mine, where the captain found by soundings that there was plenty of water. A seal dived down under the vessel and came up on the other side of it. Another allowed a rowboat to come within five or six yards of him. The abundance of animal life all about continued to astonish them. On one occasion a baby-seal came so close to the ship that one had to lean over the rail to see him: "he looked like silver when he was submerged in the clear, icy water." On another occasion a large blue seal was seen on the ice about half a mile away. The seal had one chance for his life: there was only one cartridge left for the gun! The mate took the boat and, sculling along by the edge of the pack, reached a point six or seven hundred feet distant where the boat was hidden by high hummocks. He fired the single cartridge. The seal never moved: it was shot through the head. When it was brought to the ship Mr. Longyear "kodaked" him at midnight.

Killing a Walrus. On another occasion, while still ice-bound in the fjord, a walrus was seen swimming near the

ship. Another, or possibly the same one, was later discovered on an ice-raft about half a mile away. Captain Naess and Mr. Longyear went for him in a boat. The surface of the water was covered with new slush ice, and it was like rowing through a pudding. Mr. Longyear thus describes the incident:

"As we approached the walrus he would raise his head; the man rowing would cease and we crouched as low as possible on our seats in the boat. He was lying on his side, facing us as we drew near. So we made a détour and came up behind him. Walruses are difficult to kill unless hit just right—in the neck. At a distance of about ten yards Captain Naess fired two bullets into his neck. The first one seemed to do the business, but the second was fired to make sure. The huge body gave one spasmodic jump, and then was still; I do not think that he even heard the gun. The Captain had done the shooting with his lame hand which he had unwrapped for the purpose. As his hand was aching with the cold we returned to the ship, and one of the Safe Harbor hunters and 'Uncle Pilot' returned with me.

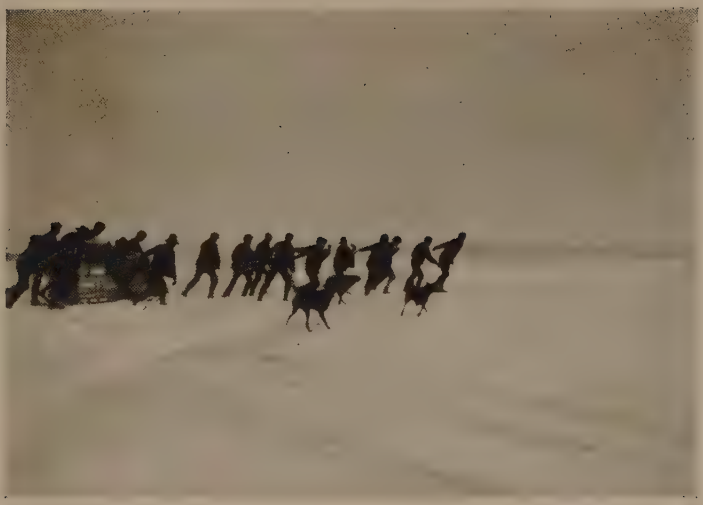
"They skinned the walrus, and I looked on, giving a hand now and then when the fifteen-hundred-pound carcass had to be turned or rolled over. 'Uncle Pilot' says it is a three-year-old bull, and his tusks are about ten inches long. He was ten feet long from nose to end of tail-flippers. The skin is about three-quarters of an inch thick, where it is cut in the skinning. On the back it is said to be more than two inches thick. Then there are two or three inches of blubber which comes off with the skin. We also left the head and flippers on the skin. We had quite a tug getting the skin into the boat, as it must weigh five or six hundred pounds. It is now lying flat on the snow and ice beside the ship to let the blood soak into the snow. The work of skinning such a big animal by just 'hand-power' was an arduous task. The meat of the walrus is almost black in color, and the blood is very dark-colored. The body was warm when we returned to it. I took a half a dozen photos of the expedition.

"The gulls and 'sea-horses' were very much interested all the time, flying about us; some lighted on the same ice-raft while we were there, and the nearby icebergs and fields of ice had colonies of birds waiting for dinner. Before we were a hundred feet away from the carcass the colonies began to move to the feast. Several seals had been swimming about, watching us and one followed us all the way to the ship. Most of the time he was within a hundred yards of the boat."

Still Ice-Bound. The weather continued "distressingly fine," and they longed for a brisk gale from the north to break up the ice. On the 26th the pilot took a boat and made soundings as far as the end of the open water, and when it was found that there was still room to turn about without going on the reefs and shoals on the west side of the bay, they moved the ship about four miles nearer the mine, and twenty men were sent to spy out a practicable road across the ice to Bear Valley, the nearest shore-point on the way to Advent Bay. There seemed to be much confusion as to distances: some of the people gave them in Norwegian sea-miles which are four in English land-miles, others in Norsk land-miles which are seven and a half English miles. In taking walks it is important to know which style of mile is intended. This is especially true in the Far North where the atmosphere is so clear that distant objects are seen as through a glass.

The following day, Saether returned, bringing word from Gilson for all hands to take as large a supply of provisions as possible and walk to the mine. He told of their first trip which had taken them twenty hours over the rough, hummocky ice. The men on the skis pushed on ahead, and announced the coming of the others, and a horse was sent to meet them just as they reached land. They were pretty well exhausted by the arduous walk. The ice in places was very rough where ice-floes had been. The snow filled the sides causing many falls and much stumbling.

Four other men arrived a little later bringing a long hand-sled which was immediately loaded with the dunnage of the men and a gang of sixteen started back with it.



SIXTEEN MEN LEAVING THE SHIP FOR CAMP

MISS BRIGHAM LEAVING THE SHIP FOR CAMP

5. SLEDDING ON ADVENT BAY

The horse was released from his imprisonment of ten days and eleven nights, and was got out on the ice by means of a gangway built from the after-deck. This was about five feet wide, but so steep and toboggan-like that it took six men to overcome the beast's reluctance to try it, and they succeeded only when one of them took off his coat and put it over the creature's head: then he was backed down the gangway without difficulty. He snorted with evident delight and immediately indulged in a roll on the ice. When he was hitched to the sled packed with provisions, he started off cheerfully for land, accompanied by eight more men. Another sled was improvised out of boards, and four men started across the ice, the sled loaded with a barrel of meat and a barrel of bread. It was the triumph of the Swiss Family Robinson repeated under the midnight sun! The stall was taken out and set up on the ice, and made an excellent stable for the express-service which was soon improvised between the ship and the shore.

On Tuesday, the 28th, the longed-for storm was apparently at hand; the sky became cloudy and dark, and a northeast wind kicked up some motion, but by night nothing had happened; the sun shone brightly, and the wind subsided to a gentle breeze. During the afternoon another school of white whales rolled by, and "Uncle Pilot" shot one, but it was impossible to tell if he killed it. If it were dead it would rise again in forty-eight hours—unless the sharks ate it.

On Wednesday there was a dead calm all day with wet snow falling. In the afternoon Gilson and three other men and a horse, and later two more horses, arrived from camp, and three loads of supplies were sent back. Gilson said that some of the English company's men had offered their services to Mangham but he had declined to hire them. He also said that the manager of the English Company had destroyed some of the location-stakes of the Arctic Coal Company, and set his in their place, and had behaved in other respects in a somewhat scandalous manner, but as he was in trouble they de-

cided to do what they could for him, especially as he had in a measure atoned by lending them two of his horses and sleighs.

A Dog-like Fox. Polar bear tracks were seen in the snow not far from the ship, but they failed to see his Arctic Majesty. That morning a fox ran across the ice in plain sight; through the glass he resembled a black and white setter dog. Three seals rolling in the snow near a hole in the ice vanished like magic as soon as Reynard approached. The men whistled at the fox and he stood still and listened for a minute or two, but decided that the noise boded no good to him and he too vanished.

The fine weather continued on Thursday; the water was so calm that it mirrored the hills and icebergs with perfect detail. Late in the morning one horse and sleigh arrived from the camp and started to return, taking Herr Baever, the German engineer, about seven in the afternoon, just as two others arrived. Miss Brigham was intending to go too, but just at that time the smoke of a steamer was seen to the south-west; it was supposed to be the British Company's vessel which would bring letters, so she changed her mind and went with the *Munroe* to meet it. The ship proved to be a whaler from Bell Sound on her way to Advent Bay for coal, the English company having sold her a supply for the season. When the whaler learned that the ice was still solid and that the Americans were using horses to get to camp she turned back.

A Disappointing Box. Miss Brigham went with the second convoy of sleighs, starting at one-fifteen in the morning and, in spite of the severe weather, reached the camp in seven hours. It was better traveling by night; under the midnight sun it is not so hot, and the snow is harder than in the daytime. Miss Brigham wanted her potted ivies and other plants to adorn the engineer's house, where she was to stay, and persuaded the men to put them in with the boxes of bedding. It happened that certain particular supplies were much needed at the camp and every load was examined with great eagerness. When her box arrived, the men opened it

and expressed in energetic fashion their disappointment at not finding what they expected and she insisted on having their words translated: she was quite startled to find that they had said, "Damn the flower pots!"

6. UNLOADING THE TIMBER

As soon as this party had set forth for the land the *Munroe* cast off the lines and sailed over to Safe Harbor, a small bay on the north side of the Ice Fjord, near the entrance from the Arctic Ocean—a little more than twelve miles distant from their ice-mooring. It was beginning to snow in what Mr. Longyear considered "a business-like way," and he notes that he was glad to see at least one thing done in a business-like way. The ice there was about sixteen inches thick and was loose along the shore where the tide, which rises at Spitsbergen three feet or more, prevents it from becoming fastened to the shore.

By repeated ramming the ice a crack was made which curved toward the side of the bay where there was a gravelly beach sloping sharply to deep water. The crack was about half a mile long. This crack would soon have given open water between the solid ice and the shore, for the large triangular sheet of ice on one side would have drifted out with the tide. So, as they needed it as a sort of dock to aid in unloading the timber, they fastened it with cables to the main ice. With the vessel moored about its own length from the shore the men began at seven o'clock in the afternoon to take off the timber, and pile it on the ice high up the beach. They constructed a sort of runway with long poles, square timbers and planks, and thus reached across the float-ice and up the vertical face of the ice-wall which was nearly six feet high—making a distance of more than one hundred and fifty feet.

When the storm ceased about four o'clock there was a considerable blanket of snow covering everything. A few yards back of the beach the rocks rose to a height of more than two thousand feet, and as they were all covered with snow the scene was more like the last of January than the

last day of May. It was so cold that the steamer's whistle froze, and had to be thawed out with a kerosene torch.

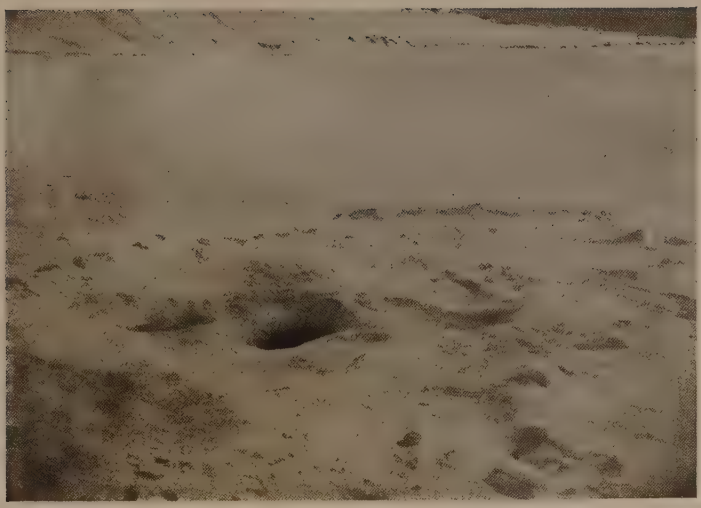
At ten o'clock that evening they left Safe Harbor to return to the road where they expected to meet more convoys from the camp. Looking down the Ice Fjord the smoke of another steamer was seen; but it proved to be three more whalers on their way to the station at Green Harbor. These also were prevented by the ice from entering, and went across to Safe Harbor on the north side, while the *Munroe* returned to her former moorings. The storm had set much ice adrift but had not moved the horse-stall, tarpaulin, and various supplies left piled on the floe. A horse and driver from camp got there just as they did, and they were most relieved to hear that Miss Brigham had arrived at the camp all right.

The next day, which was June 1, the *Munroe* returned to Safe Harbor and found the three whalers made fast to the ice, not far from their beach runway. The men kept at work day and night unloading the lumber. The sun was shining brightly in the north all the time.

7. A TRAMP ALONG THE SHORE

The next day after breakfast Mr. Longyear borrowed "Uncle Pilot's" big Tromsø boots. This footgear has a water-proof tongue and is laced over the instep, while the leg is buckled with three straps. He wore in them two pairs of socks and sealskin slippers, and found them an ideal rig for a cold country. He thus describes the tramp which he took:

"I set out from the ship and walked to the north end or head of the bay, across which is a glacier. The distance is about two miles, and I walked on the level ice all the time. The first mile the walking was good, for the snow was only three or four inches deep on the ice, but, as I neared the inner end of the bay, the snow became deeper until it was two or three feet deep near the glacier. There was a crust which held me up about half the time on the way up, but on the return-trip the sun had softened the snow so that I broke through at almost every step. I was mighty glad to get back



A SEAL-HOLE IN THE ICE

THE NEW DOCK AT ADVENT BAY

to the shallow snow which was all slush then, but the walking was so much easier that I felt as if I was on an asphalt pavement.

"I tried skis for a few minutes before I left the vicinity of the ship, but the straps were not well arranged and my heels kept slipping off, so I left them, but wished I had not many times while I was in the deep snow.

Hosts of Seals. "A lot of seals seem to live here. They have holes through the ice which they keep open all winter, so that they can come up for air and lie on the ice. Soon after leaving the ship, through the fieldglass I counted thirty six seals scattered over about two square miles of ice. I visited some of the holes but the seals disappeared while I was still half a mile away. The hole is round, and the water running from the seal as he comes out of the hole has made the snow about it all smooth ice. An area of several square yards about the hole is packed and smooth where the owner has rolled and laid him down to sleep—with at least one eye open.

"I saw three places where foxes had crossed the bay since the snowstorm of Friday, but I did not see any fox. I also examined the landscape frequently for Polar bear. I saw no tracks, but the place is a good one for them, and if there were any around I wanted to see them early in the race for the ship such as would soon follow such a discovery! The number of seals and the ten Polar bear skins the hunters had in their camp near the ship were all reassuring, but in case they had missed one I wanted to miss him too—and I did!

"I walked about a mile along the front of the glacier, and found it very interesting. The ice cliffs seem to be from one hundred and fifty to two hundred feet high, and look more like white marble than like ice. In places the greens and blues of the ice touch up the scene, and the millions of icicles all over the face of the cliff caverns, towers, etc., help to show that it is ice. Vast crevices split the ice from top to bottom for some distance back from the front, but the top of the glacier, looked at from a distance through the glass, seems to be as smooth and flawless as a gently undulating field. The

front seemed to topple over in great and small masses, so that the façade shows a variety of towers, pinnacles, minarets, steeples, slabs, etc., more or less ready to fall.

"I made one attempt to get near enough to measure my height against the face of the ice, and so by doubling and doubling again and again by eye, from a short distance, to get an idea of the height. When I was still fifty or sixty feet away, I saw that icicles from the top of the slab were hanging over me, and at about the same distance as the base from me. It looked to be liable to fall any moment. I came to the conclusion that the front of the glacier was a good place to stay away from—and I went.

"I frequently heard small pieces of ice fall, and there were snapping, cracking, grinding noises, and the sound of running waters in many small streams. I concluded that if this slab of ice, as large as a three-story brick building, should fall on me, it might bother me to get back to the ship. So I left my curiosity unsatisfied. As I approached the glacier this particular piece of ice looked small, for the cliffs behind were two or three times as high."

8. CLUMSY WORKMEN

When he returned to the ship the men were still working like beavers. In fact with only a little rest they kept at it for twenty hours; but Mr. Longyear was surprised to see how they seemed not to know how to do anything except "by main strength and awkwardness." He wanted to take hold and show them the right way, but as he could not tell them in their own language he kept wisely silent. "When I try it," he said, "they do it more wrong than when I keep still."

Arrival of the English Ship. The next day, at three-thirty in the morning, Captain Naess announced that another steamship was coming, and they ran out to meet it. This time it proved to be the looked-for English steamer. Captain Naess and Mr. Longyear went aboard, and found Messers Black, Brubik, and another of the directors of the company. They were thrown into consternation on learning of the

trouble at their mine. Their Norwegian agent had already sold several thousand tons of coal for that season's delivery and they had chartered a ship at five hundred pounds a month with which to deliver it to the consignees in Norway. There was no harbor at their camp, and the coal had to be loaded upon a lighter from a small dock at the edge of the water, and then transferred to the ship. This could be done only when the weather was fine.

Disastrous Losses. The ten men that had worked during the winter had got out about two thousand tons, but the vein had four bands of "bone" in it, making an enormous amount of hand picking necessary; it was practically impossible to get clean coal. As the company had spent, according to report, not less than seventy thousand pounds sterling on the enterprise, and they had practically nothing to show for it, disastrous failure was staring them in the face.

The coal was shipped later in the season but proved to be most unsatisfactory, and for a time gave Spitsbergen coal a "black eye." The Arctic Coal Company's product was looked upon with great suspicion, and it took some experience for users to learn that it was not the same kind as that delivered by the English Company.

Departure of the Lighter. The vessel had in tow a fine lighter; it occurred to Mr. Longyear that they might like the *Munroe* to take charge of it. The *Munroe* ran over to Safe Harbor again and proposed to the captain of the whaling-steamer, *Star,* to tow it to Advent Bay for them after the ice moved out, but as the whaler was expecting to put out to sea within a day or two, the arrangement could not be made. This was a disappointment because then all the supplies on the *Munroe* might have been transferred to it and delivered at their camp as soon as the ice went out. The English ship was turned back to Norway, and the lighter went with it. The directors put their heads together, and composed a letter which they asked Mr. Longyear to deliver to their superintendent and this was effected through the instrumentality of Gilson.

When they reached the road again three horses with sledges were waiting, and after their loads were arranged, were despatched to the camp accompanied by a number of the men who had been unloading the lumber at Safe Harbor. They had unusual delicacies for their table: one of the hunters brought in two gray geese, and nine *ryper* or Arctic grouse; and the captain of the *Star* presented them with a piece of seal meat—all dressed for cooking.

9. LANDING AT ADVENT BAY

The next morning after breakfast, as a horse and load were starting for the camp, Mr. Longyear decided that he would go along. With one pause of half an hour to feed the horse they reached the engineer's house at half-past five. It was a rather fatiguing journey. Mr. Longyear had prepared a fine luncheon and wrapped it in paper to put into his coat but laid it down and forgot it; all he had was a bottle of tea. The walking in the morning was not so bad, as the crust over the snow bore his weight, but the bright sun soon softened it, and after an hour he found himself plowing through slush which was up to his ankles, and in places half way up to his knees. The surface of the ice was covered with water.

About noon a fog came pouring in from the ocean, making fantastic festoons around the tops of the hills, but though it did not descend so low as the ice it made the air pretty cold. There was a narrow ledge on the back end of the sleigh, and though it was slippery with slush, Mr. Longyear was able to ride on it by standing sidewise and clinging to the cord that lashed the load in place. When the little Norwegian horse paused to rest, he would walk on in advance until he was overtaken again. Thus no time was lost. He was surprised to find that the little pony could walk faster than he could.

The New Dock. The next two days—June 5 and 6—were bright and warm, and the time was spent in inspecting the work accomplished. During the winter Mangham and his

men had driven piles and put on caps for a dock to extend out about six hundred feet to deep water, where ships could lie alongside and take on their cargoes. The rising and falling of the ice on the tide constantly threatened the stability of this construction, and had caused Mangham much concern. Gilson immediately on his arrival ordered a filling of rock which was the only way to break the ice and protect the dock. A tramway was laid across the ice from the shore where there was an abundance of suitable rock, and mining-cars were used to transport it. Poles were placed horizontally behind the piles in front of the dock so that the filling might not fall out on that side and interfere with ships, and when the entire structure was filled to the decking no further trouble was experienced; the never-melting ice bound the rock together in one mass and formed a sort of island around which the winter ice would break as it was lifted and dropped by the tides.

The dock was connected to the shore by a trestle also loaded with rock, and this constituted a dyke, which was subsequently fully filled with rock and made as solid as the dock itself.

The Mine-entry. After dinner they went up to the mine, which is about four thousand feet from the dock. Here Mangham had effected the main-entry, twelve feet wide and seven feet high, to a considerable distance into the hill-side, had opened several cross-entries, and prepared long walls ready for mining. The carpenters had also framed timbers for coal-pockets at the mine the entrance to which, situated about seven hundred and fifty feet above the sea, was at the top of a steep talus of slide-rock over which rose the perpendicular precipice of the mountain. A "jinny track" had been built down to the valley below, and all the timbers, machinery, and other heavy material used in the mine and for the loading-station and tramway was hauled up this track; a compensating car, loaded with coal descending, served to pull it up without waste of labor. In this way a considerable pile of coal was accumulated at the lower end of the tramway. On the next

visit of the steamer this fuel was used with excellent results, the ship's engineer by a careful test estimating that it was at least sixteen per cent better than the English coal he had been using.

Coming down from the mine over the coal-dump, which was composed of rather fine lumps, Mr. Longyear started to follow Gilson and Mangham, but his feet flew out from under him, and he tobogganed gracefully down—a distance of two or three hundred feet, in about a minute. The others regretted not having their cameras with them!

They had reindeer venison for supper. During the winter the hunters had killed eighty deer, and that afforded the camp a welcome change from frozen and canned meats.

The Tourist Hotel. The next morning they went over the old hotel, which was used as a lodging for the men. There were barracks for the miners not far from the mine, but not as yet sufficiently extensive to accomodate them all, and the hotel which stood on Advent Point nearly two miles away had its inconveniences. They had to be carried in a steam launch from there to the dock in the morning, and returned the same way in the evening. Near the hotel stood the engineer's house which Munroe had built, and which Miss Brigham was filling with artistic furniture constructed on her own designs and made by herself.

Tracks in the Snow. After discussing various affairs Mr. Longyear, with Saether and Gibbs, one of the English pit bosses, returned to the ship with the horses which were to carry back the last loads. The horses had no loads; so they were able to ride the whole way. As the sun was shining brightly it seemed impossible that it was night. At one place a fresh reindeer-track followed their road, mostly running beside it, and a little distance away were the tracks of a Polar-bear; neither animal was seen. Reindeer are very curious and this one was probably investigating the track of the sleighs. Many seals were lying by their holes and some of them allowed the visitors to approach within a hundred feet before they took "headers" into the water.

AT THE MINE ENTRANCE

RUSSIAN-BUILT LIGHTER

10. THE TRIP BACK TO NORWAY

Shortly after noon of the next day, the last loads were entrusted to the sleighs, and the *Munroe* cast loose from the ice and started on its return journey to Norway. First they filled a boat lashed to the main hatch with ice from a glacier at Safe Harbor. A small whale carcass was anchored near by, proving that one of the whaling-ships had been at work. It was covered with birds getting a free feast.

When they reached Bell Sound at ten-thirty they found eleven other vessels there, most of them whalers. As they went in they passed to the windward a steamer towing a dead whale. An English miner from Yorkshire exclaimed "'E smells a bit 'igh." Many of the whalers came aboard with letters to be mailed in Norway; two came into the cabin to write some telegrams, and left a strong odor of whale. Many of the vessels had whales alongside of them, and all around were enormous flocks of sea-fowl.

The Return Voyage. After the ship entered the Arctic Ocean it encountered a mass of pack-ice too solid to force. They were compelled to make a long détour west, northwest, and north, then after several hours west again, then west by south, until they were nearly fifty miles off their course which should have been south by east. At one time they passed a school of bottle-nosed whales near the edge of the pack. On June 10, as they approached the coast of Norway, they ran through a fleet of twenty or more boats fishing for cod in what was evidently very deep water. At Tromsø Mr. Longyear, Herre Saether and Captain Naess went ashore, posted nearly a bushel of letters, and got off a number of telegrams to Trondhjem so as to expedite the delivery of the cargo for the return trip to Spitsbergen. They also delivered to Mr. Black, director of the English Company whose ship was at anchor there, the letters his manager had sent by Mr. Longyear.

The English and the Mutinous Miners. The Directors of the English Company had requested the British Minister at Kristiania to order a cruiser to go to their camp on Spitsbergen and try the mutineers by court-martial; but

he refused to interfere. Then they requested the Norwegian Government to give them some soldiers and marines to accompany their ship, and keep order among the insurgent Swedes while they were brought back to Norway. This was manifestly impossible, for the English camp was on territory not controlled by Norway, and the ringleaders were not even Norwegian citizens. Mr. Longyear some years later wrote regarding this episode:

"Norway refused to take any action in the matter except at the request of the British Government, and that Government refused to make the request. Later the ship was sent to the English camp and all hands were brought to Norway, where the matter was put through the Norwegian Courts as far as the Courts could assume jurisdiction. This jurisdiction related only to the contracts between the men and the Company. These contracts had been made in Norway, and the Courts therefore took jurisdiction.

"As the mutiny occurred on foreign territory, and the trouble was between subjects of Great Britain and those of Norway and Sweden, the Norwegian Courts refused to take up that matter. The only question adjudicated was in regard to the contracts—whether they had been properly filled and carried out. The Courts held that the men had not filled their contracts, and that the British Company not only did not owe them any wages but that they owed the English Company for their board during the winter. This debt, of course, there was no way of collecting; but it was a legal victory for the English Company, and has doubtless been of value to us by showing Norwegians that their Courts will not sustain them in violation of contracts.

Liquor at Spitsbergen. "The English Company made a great mistake in allowing the use of alcohol at their camp. They also allowed the men the use of firearms. We have profited by these mistakes of the English Company and do not allow any alcoholic beverages, except such as may be kept by the officers of the Company for emergency use. We also allow no man to have firearms, and the Company owns all

the firearms at our camp. They are occasionally granted to certain men for specified times, such as hunting for the camp. The guns are issued to them when they start on an expedition, and are reported to the office when the men return to camp.

Careful Selection of Men. "The English Company was very careless in its selection of men, hiring almost anyone who applied for a position. I have heard it said in Norway that the police were glad to see a number of the men go who went to the English camp, and it is rumored that certain of those men went there with the intention of creating trouble. In employing men we have made them show good character by references which we have investigated. We sometimes leave it with the foremen who are held responsible for the character of the men they employ. They have facilities for ascertaining the character of the men, and know many of them personally. In this way we have avoided serious difficulties, and have had almost invariably good men. I know only two exceptions, and they borrowed recommendations as they had none of their own.

"The English camp, when it was abandoned, had a large quantity of supplies and about a dozen excellent buildings. These we offered to buy, but the English Company cherished a hope of selling their entire property for enough to reimburse them for their outlays. The hope has not been realized, and the supplies were wasted or stolen, and the houses are now said to be wrecks, as fishermen, hunters, and others have visited them and carried away whatever they pleased. In 1909 the camp was still in charge of caretakers, but these were afterwards withdrawn, and the camp has now remained for several years without protection."

11. THE NUISANCE OF STRONG DRINK

When Mr. Longyear and his companions got back to the ship in Tromsø Harbor the water, coal and provisions required for their further journey had been delivered. All the

men that went ashore had been ordered to report by noon of the 12th. Three of the crew and several of the workmen from Spitsbergen were missing. Sober men from the winter crew were engaged to take the places of the tardy sailors. The Captain raised the anchor, and got under way at three in the afternoon. As the vessel ran by the town three boats with men gesticulating wildly put out from shore but no heed was paid to them, and those on board wondered if the "booze" which had caused them to lose their places was worth what it would cost them. They would have to get to Trondhjem as they best could, either as substitutes or extra hands on some coastwise fishing-boat or other craft. The *Munroe* passed hundreds of fishermen making their way back from Finnmark, east of the North Cape. There would probably be chances for their home returning.

Smuggled "Booze." Some of the winter men that had been discharged and did not expect to have employment with the Company managed to escape the vigilance of the Captain at Tromsø and succeeded in smuggling aboard several bottles of brandy. Mr. Longyear was on the bridge at the change of watch, and noticed that the wheelsman reached three times for the wheel before he got hold of it. He was almost helplessly drunk. This was immediately reported to the Captain who made an investigation and found several of the crew in the same condition. He ordered them to their berths, and they obeyed without making trouble. Captain Naess also found bottles of liquor concealed in the forepart of the ship, and threw them overboard; but he did not confiscate it all, for soon afterwards the mate appeared on the bridge as crazy-drunk as he had been on their trip to Spitsbergen. The Captain was again obliged to summon several men to remove him by force to his bunk, where he soon fell asleep.

They were giving free passage to the skipper of a fishing-vessel—a first class coast-pilot—and they employed him as mate during the rest of the voyage, and completed the crew with sober men from the island, most of whom were good sailors.

THE UNTRUSTWORTHY MATE. The next day, the mate, accompanied by Saether as interpreter, went to Mr. Longyear with abject apologies, declared his intention of signing the pledge as soon as he reached Trondhjem, and begged to be retained in the Company's employ. Mr. Longyear reminded him that he had recently made the Captain a similar promise, and had broken it at the first opportunity; he told him, however, that if he would keep from drinking for one year and would furnish proper evidence, there would be no objection to the Captain's taking him back if he liked. He was to understand, however, that the enterprise was not a reformatory or a benevolent institution, but a business-venture: too much money was at stake to jeopardize it by employing men that were unable to resist the temptation of strong drink.

Although the Captain discharged him from his position as mate he set him to work after they reached Trondhjem as stevedore in unloading the ship. That work was finished at seven o'clock on the evening of June 14 and Captain Naess paid him off. Before midnight the police had conducted him to the lock-up in a state of crazy intoxication, too dangerous to be left at liberty. Mr. Longyear two years later saw him at work as a carpenter at Advent Bay. When he was sober he was an excellent workman and a good sailor.

DRINK THE CURSE OF NORWAY. "Like so many others of his countrymen," says Mr. Longyear, "he seemed to have no power of resistance when liquor was offered. Drinking appears to be the curse of Norwegians. They seem to have no will to withstand its allurements, and they have no 'head' for it. The laws of the country have properly been made very strict, and this has been of great benefit to the Norwegian people, but absolute prohibition is probably the only thing that will altogether save them from the evils of alcohol."

He assured Captain Naess that if his people could not furnish enough sober sailors to man the *Munroe,* he would try men of some other country, and at Trondhjem all the crew were discharged except the first and second engineers: the second engineer was put on probation. New men were engaged.

V. ACTIVITIES AT SPITSBERGEN

1. LOADING AT TRONDHJEM

MR. LONGYEAR'S chief reason for returning on the *Munroe* was to settle the matter of her registration. He did not know but he would be arrested, and the ship be confiscated. But nothing happened. He went to the office of the American Consul, Herre Berg, to execute some private papers and was asked his name. When he said he was the President of the Arctic Coal Company, Herre Berg spoke pleasantly of Munroe, and nothing was said about the irregularities in the clearing of the steamer. The home office had registered the ship under the provisions of private vessels, and the *Munroe* continued to hail from Boston and sail under the American flag.

The lumber was all ready to be loaded, the iron-work for the tramway had arrived from Germany, and the men were working night and day to load the ship with it. They put the lumber in the hold first and the tons of iron-work on top of that. They were subject to a fine if they worked between nine o'clock on Sunday morning and five in the afternoon.

A Sunday at Fjeldsaeter. Sunday, Mr. Longyear, with Mrs. Munroe and a friend, drove to a resort hotel called Fjeldsaeter—or Mountain pasture—situated on a height of about twelve hundred feet above the city, and four miles distant, with a splendid view of the whole country as far as the mountains of Sweden. In winter it is much visited for the skiing and other snow and ice sports. The hotel was built in typical Norwegian style with paintings of Norwegian scenes and subjects. On the very hilltop, about five hundred feet higher, there was an outlook furnished with a circular map of the region, and on the margin an outline of the hills

with a revolving sight, so that by putting the pointer on the line extending from the center it indicated the particular mountain at which it was directed.

Needed Articles Lacking in Trondhjem. By Monday morning good progress had been made in loading the ship; but great difficulty was experienced in finding anywhere in this town of forty thousand population various utensils and equipment such as would be expected to be on sale in any place of five thousand inhabitants. River-drivers' canthooks and large-toothed ice-saws were unprocurable, and the longest wire-cable anywhere in stock was in six hundred feet lengths, whereas they needed one at least twenty-eight hundred feet long. They had to send to England for it, and that would entail weeks of waiting at Spitsbergen unless some other way of working the trams could be devised until its arrival. It was difficult to induce the stevedores to continue working after six o'clock in the evening did not someone with authority order them to "stick to it." The result was that on Monday the workmen all quitted, and the lumber yard was locked up for the night. The Norwegians have not as yet adopted into their language the Yankee slang-word "hustling."

A Stupid "Photoman." Mr. Longyear had taken a large number of photographs and left the negatives to be developed. The photoman, instead of keeping the negatives and prints of each roll of film separate, carefully put all the negatives in one package and the prints in another, almost hopelessly mixed, some of them spoiled, and many wholly missing. It took Mr. Longyear from nine o'clock till three in the morning to sort them out—a most annoying and needless labor which might have been saved if the bungler had used a grain of common sense. In order to make the count correct he had printed duplicates mostly of subjects which were not wanted.

By four o'clock of Wednesday, the 19th, the load was all on board except the dynamite, which, in accordance with the law, had to be delivered from a lighter outside the harbor-limits, and only after twenty hours' notice of leaving-time. They left on time, carrying as a passenger a young Canadian,

who went with the understanding that he was to take everything as it happened, like the others on board.

Between Tronhjem and Tromsø they encountered a school of big porpoises which amused themselves and the spectators by diving under the ship and then jumping straight up into the air six feet or more, and coming down on their sides with a tremendous thump and splash. They made no objection to being "kodaked." One of them raced with the ship not ten feet away, and came out ahead. In the Vest Fjord they met three smacks tied side by side, bowling along under full sail to the music of a string-band. It was a wedding party returning from some church. They ran up their flag, a courtesy the *Munroe* reciprocated. A little later while the Stars and Stripes was still flying they met the tourist-steamer *Ceylon* crowded with passengers, who cheered enthusiastically: one man leaned over the rail waving a small United States flag, and yelling with all his lungs, much excited to see a ship flying his own flag.

2. NORTH AGAIN

They reached Tromsø at half-past three in the morning; having telegraphed to the people who were to go with them. They found everything in readiness and were able to sail at nine. The Arctic Ocean, which they entered on Monday, the 24th, welcomed them with a strong east wind and a violent storm. The bureau in the Captain's stateroom behaved as outrageously as if it had been intoxicated: it broke loose, skated across the floor, and toppled over. The engineer came with staples and hooks, and fastened it back into place. At breakfast neither Saether nor the Canadian deigned to put in an appearance. Mr. Longyear balanced himself on a sofa, and performed the prestidigitatorial feat of holding a cup of coffee in one hand and eating a slice of toast from the other. His first egg escaped from the cushion of the long seat at one side of the table, and spread itself on the floor in company with other sliding articles. Another horse taken along proved to be a better sailor than the first one. The lumber on the

deck began to show signs of uneasiness, and while the captain turned the ship across the seas to east by north and reduced the speed to just enough for steerage way, the crew worked three hours in putting in additional stakes and extra lashings of rope over the deck-load of lumber. They remained "hove to" until two the next morning, when, the wind and sea calming somewhat, the course, due north, at full speed was resumed. There was heavy fog which shut off sight of Bear Island but the presence of land was indicated by many auks, "sea-horses," gulls and other birds.

On Wednesday they renewed their acquaintance with the ice-pack, still too solid to ram; they had to make a long détour to the west. At three in the morning they met a number of seal-hunting smacks, and the steamer *Laura* which was reported to be leased to a party of American hunters. They were all "hove to" under the lea of the ice-pack. At five in the afternoon they passed a fleet of eight whaling-steamers, two of them towing dead whales. One of the captains told them they were forty-five miles south-west of Bell Sound.

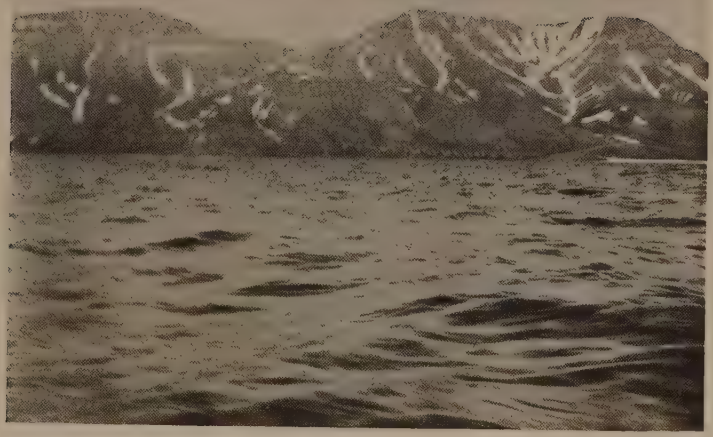
A Whale-hunt in the Fog. They saw a whale spouting a mile or so away, and one of the whaling gun boats set out after it. They watched the chase for half an hour or more until it was too far away to see, but they soon heard the report of the gun and judged that the chase was successful. A whale has little chance of escape from a steamboat armed with the modern bomb-harpoon fired from its prow gun. It has to come up to the surface of the water frequently to breathe and its spouting betrays it.

A strong, bitterly cold wind blew all day, and would have kicked up a heavy sea but for the ice field, which allowed them to run in quiet water. Toward six o'clock the clouds began to break, the air became much milder, and promised fair weather. For some hours they ran through miles of heavy drift-ice, but so broken by the westerly wind that they were able to thread their way around and among the bergs without bumping into any of the heavy ones. Bell Sound was still blockaded, and they could not enter.

They had better fortune at Ice Fjord: the pack, as if repentant at having caused them so much trouble at their last visit, took advantage of the strong wind, and had gone out of Advent Bay, only the day before. There was open water for more than thirty miles from the coast. They ran into Green Harbor to deliver mail for the whaling-station there, and met a steamer just about to tow a whale to Bell Sound. They reached Advent Bay about four o'clock in the afternoon of June 27, taking everyone by surprise: they were not expected before the last day of June. Gilson, Mangham, and Baever came out in boats to meet them just as they dropped anchor off the dock.

Mr. Longyear went ashore with them. He had told the Captain that he would sleep on the ship, but a fierce wind was blowing, and he decided to remain on shore. The Captain not knowing his change of mind sent a sailor for him in a row-boat. So he went back with the man, starting about ten o'clock; it took the man forty minutes to cover the half mile or so out to the ship. As they approached the ship some of the men on board tied a long light line to a float, and sent it out toward them. When it was less than six feet away it took ten sturdy strokes for the oarsman to get within reach of the float, but, having caught it, he pulled the boat alongside the ship hand-over-hand.

A Robber Ice-pack. Two other steamships were anchored not far away: the *Eric Jarl,* a small vessel from Trondhjem carrying the ornithological expedition of Professor Koenig of Bonn University to King Charles's Foreland; the *Daggery,* a vessel belonging to the English Company which had arrived the day before, anchored near their camp, and let the steam go down. While those on board were serenely sleeping the ice had gone out, carried the vessel along with it, set her aground in a shallow place, and taken the lighter, which they had in tow, out to sea with it. The *Daggery* was floated at the next high-tide and succeeded in rescuing the lighter from the robber-pack! It was said that the new men who had come on this ship to work for the



ENGLISH CAMP ON NORTH-EAST SIDE OF ADVENT BAY

S. S. "MUNROE" DISCHARGING CARGO AT THE NEW DOCK

company were refusing to take orders from the manager, who had embroiled himself with the winter crew.

A Russian Lighter. The next morning was fair and bright, though the wind still blew a gale. High up on the shore opposite the vessel lay an old black lighter, or *lodya,* which had been bought in Tromsø but had been made in Russia by women, who after the manner of their kind, instead of using nails, sewed it together with a root remarkable for its indestructible quality. It can be taken out of old boats and other craft, and used over and over. A line was run from the ship to this interesting construction, and when the vessel moved slowly away from her anchorage, the lighter obediently followed and took to the water as gracefully as a duck. When they moved up to the new dock the lighter was used to get the horse ashore.

The captain showed great skill in mooring the Munroe to the dock, which was only about a third as long as the ship. The men went to work immediately unloading the cargo of timber. It was laid across the piles and open frame-work of the new dock, making a floor on which the rest of the cargo was piled.

Mr. Longyear Inspects the Loading-Station. On Saturday Mr. Longyear and Gilson walked over the line of the new tramway to the site of the loading-station. This time in descending the coal-dump he was more successful than before in keeping his balance. Once he sat down suddenly but regained his feet, and reached the bottom of the steep pile in two or three minutes. About five in the afternoon he was rowed by a man across to the engineer's house on Advent Point which was now renamed Munroe Point. He intended to return to the ship for the night, but the same fierce wind, after dying down a little, blew harder than ever, so that it was hopeless to think of contending with it. He stayed for dinner, and spent the night there. The sailor drew the boat up on the beach and walked back to the ship. Miss Brigham was still at work on her box-furniture, and had made almost enough to furnish all the rooms. In the evening Gilson shot

a number of the pretty water birds called "tess" (*teist* or black guillemot), which are black and white with sharp bills and red feet, and considered very good for eating.

End of the British Company's Operations. About midnight the wind at last subsided, and shortly after one o'clock in the morning of the 30th the *Daggery* was seen leaving her anchorage, and heading down the fjord. Later the report came that all the warring factions of the English camp were on board—and that was the end of the English company's activities in Spitsbergen—an ill-managed and costly venture, ending in a fiasco.

In the forenoon Mr. Longyear and Gilson walked along the beach for a few miles and returned across country. Gilson shot more "tess" and they saw several white whale carcasses, and fragments of whales which had furnished feasts to innumerable birds. A schooner belonging to a whale-fisherman was anchored about three miles west of the point, and Gilson bought from its skipper 800 eider duck eggs which are about twice as large as hen's eggs. They agreed to pay him 48 kroner, half in cash and half in coal.

3. VISIT TO A GLACIER

On Monday, July 1, Mr. Longyear went with Captain Naess to the glacier at the end of the valley, both of which were named in his honor by Munroe. It was a seven hours' tramp, and a part of the way over difficult ground—if snow and ice can be called ground. The first two miles or so one follows along the bed of a stream which, when it is in flood, has a width of almost half a mile and judging by the huge ridges of stones piled up by it, must discharge an enormous volume of water. They found it at that time of the year running only in narrow channels easily fordable almost anywhere, cutting through the flat glacial débris—boulders, stones of every size, gravel, sand, and mud, with fragments of coal indicating that the glacier had been destroying coal-bearing formations in the interior of the island. Mr. Longyear thus describes the glacier:

Mr. Longyear's Description of a Glacier. "The first face of ice is a bank, about one hundred feet high, a steep slope with boulders and rock fragments protruding all over the face of it. These boulders are continually falling, as the melting ice liberates them, and they come crashing down the ice-slope to the bottom. I think I saw at least fifty come down, so I had no desire to get near the line of 'bombardment.'

"We went up the face of the glacier at one side where it was all rock surface with no bounding boulders, and we could hear water running several feet below us. After ascending a hundred feet or so of rock and stone surface we came to a steep slope of white snow-ice. The rise for about half a mile was fifteen or twenty feet in a hundred. I supposed that would be the top, but then I found about a mile and a half of slope rising six or seven feet to the hundred. The surface of the snow-ice was soft slush and water, making the walking heavy. From this point we could see the hills beyond Coles Bay Valley. We could also see our camp at the mine. The sides of the valley rose in steep slopes and precipices on both sides, a thousand feet or more above us, and we estimated that we were at least a thousand feet above the ship.

"There was more or less rock everywhere on the surface of the glacier, and much of the rock contains fossil leaves or leaf and grass-impressions, many of them of great beauty and of wonderful distinctness. It is difficult to get specimens, though, for the rock will not split well but shatters or breaks into small fragments.*

"The return trip was made much more quickly than the up trip, as we did a good deal of sliding on the steeper slopes where the ice was harder, and the water runs off more freely than on the flatter portions of the glacier.

"A fox barked at us once but we did not see him, and the birds, nesting in the cliffs on both sides of the valley, scolded at us but we could seldom see them, they were so far above us."

*Swedish geologists have found the same difficulty in securing perfect specimens.

A Pile of Freight. By three o'clock in the afternoon of Tuesday, July 3, the *Munroe* was wholly unloaded, and every one was amazed to see the enormous amount of freight she had carried. It was piled all over the dock and lined the beach. Taking a lighter in tow, and giving free passage to the horse that had been borrowed of the English Company, they sailed across to the English camp where they deposited him on land; then they went to Munroe Point and delivered their dynamite at the powder-magazine, and left provisions and coal for the Engineer's house and the old hotel barracks.

Making a Raft. After supper, at half past nine, they left for Safe Harbor to get the timber deposited there on the first trip. Arriving a little after midnight the men began constructing a raft of it. There had been an unusually high tide, and much of the timber was strewn along the shore. The sea could not conquer its ancient habit of piling the Spitsbergen shores with driftwood. Apparently not much of the timber was lost, but the work of locating and salvaging it was made very slow and arduous. The men labored for seventeen hours, taking only two for meals. At six o'clock in the afternoon they knocked off to rest till morning. Eighteen round poles from 40 to 50 feet in length, intended for piles, were chained together as a foundation. Crosswise over these were placed shorter poles securely fastened at the corners. On this foundation were piled the rough-sawed timbers and on stop of all the dressed lumber was disposed.

Inefficient Workmen. It took two days to accomplish what trained lumber-jacks would have easily put through in ten hours. Many of the men had never made a raft before. Mr. Longyear furnished them with steel timber-hooks which were the nearest approach to canthooks that could be found at Trondhjem and showed them how to use these tools. Some caught the idea at once, but others kept turning the hooks the wrong way, and always at the moment when the utensil would have been of the greatest help, would drop it and take hold with their hands.

BUILDING THE RAFT

HUNTER'S HUT, SAFE HARBOR

An Eider Duck Colony. While the men were thus engaged at Safe Harbor, Mr. Longyear examined the gravel bank lining the beach, and found it composed entirely of a very dark marble or serpentine, with white veins of various widths, making extremely pretty pebbles. There were also boulders of soapstone and fossiliferous limestone. He and Captain Naess visited the scanty remains of an ancient whaling-station. The fragments of wood had not rotted but were much splintered—perhaps by frost. They visited also a rocky islet at the end of the point on the East side of the Harbor where was a vast colony of eider ducks. The birds would let them approach within ten feet of their nests before they would fly off to a little distance and watch the visitors apprehensively. The rocks were so covered with nests that it was difficult to take a step without crushing one. Captain Naess picked out three eggs, and Mr. Longyear used up his film in kodaking the unusual scenes. When they took their departure the birds, manifesting great relief, immediately ran back to their nests. The neighboring rocks and the ice were covered with ducks and gulls studying the strangers with interest. Millions of auks nest on the cliff at the west of the harbor entrance. There were quantities of eider down all about but mixed in with dust, dirt and moss. The male eider duck is a brilliant black and white; the female is a dull brown, and not easy to distinguish from the surrounding rocks.

The next day, as the raft was progressing, Mr. Longyear investigated a half-dozen odd-looking mounds scattered along the beach just above the top of the slope, and found they were the remains of old "boileries" from the good old days when Spitsbergen was coining money for the Moscow Company and its rivals.

Ancient Coffins at Safe Harbor. Near one of them, side by side, were two long narrow boxes wider at one end than at the other, the tops just rising above the ground partly covered with large stones. They were evidently coffins. Captain Naess lifted the broken tops and disclosed two skeletons.

Safe Harbor, discovered by the Dutch and named by Van Muyen Behouden-Haven, was known under various names in the old whaling days. Baffin calls it Poopy Bay or Nickes Cove. It was also called Port Nick, and so marked on some charts. It was the scene of many bitter contests between the Moscow Company's ships and interlopers, English or foreign. These graves may have been for victims of some battle, for blood was often shed in those desperate struggles to assert rights to capture whales and boil their blubber.

A Waterfall. On another walk Mr. Longyear and the young Canadian, Street, dicovered a waterfall fifty or sixty feet high tumbling down over a glacier and wearing the ice into curious and often beautiful shapes. By the side of the upper leap of the fall was a wonderful pavilion with many crystal columns, and a dome-like roof. On the way to the glacier was a hunters' hut, like those built by the Lapps and called *Kammer*. One end was made of lumber, the other was covered with earth and moss-sods. The door was nailed up; all around, near by, were disgusting heaps of foul refuse —bodies of auks, geese, teisret, eider ducks, foxes, polar bears, mixed with bones, feathers, blubber and ordure of every sort —a horrible mess, but with no odor. The cold ground and air prevent rapid decay, even of flesh.

They climbed up the glacier; first ascending a gently-sloping *Muskeg* of frozen mossy swamp till they reached the moraine, which was composed of a mass of broken marble, with sharp angular pieces of every size. It was so steep that they had to climb it on all fours. The glacier itself, more than a mile wide, sloped gently down to the right and up to the left. It was very steep on the side toward the ship, and Mr. Longyear made his first experiment of sliding down on a flat stone for a toboggan. He thus described his descent:—

"The surface of the glacier, except on the steepest faces, was covered with soft wet snow or decomposed ice, several inches deep. I sat my stone very well until I came to a place where there was bare ice, and then I 'scooted' for about a hundred feet and landed at the base of the steep slope, ac-

companied by a small avalanche of snow, slush and rocks, but my flat stone was not under me. Under me was slush and ice and I got up quickly. But it was a very successful trip—for a first attempt. I shall do it better with practice."

He continues his account of the excursion:

A Visit to the Auks. "Leaving the hunter's hut, we walked toward Auk Cliff, where thousands of auks have their nests. The din made by the birds was tremendous, and although we were perhaps not nearer to them than half a mile we thought there must be some excitement among them, but Naess says the noise is continuous during the nesting season. At times it sounded like a big kennel of dogs barking." This was a rather unusual way of celebrating the Fourth of July.

They had cherished hopes of getting back to Advent Bay in time for a big dinner at the engineer's house, but the raft was not completed until seven o'clock. It was about fifty feet long, sixteen feet wide, and rather more than four feet high, with the dressed lumber in the middle as high again. Four men with two row boats were detailed to be its crew and watch it during its voyage to Advent Bay. This consumed nearly seven hours, but it was uneventful. The lumber was moored at high tide close by the shore, and from there at low tide, carried piecemeal to the lumber yard, a comparatively easy task.

A Shipwrecked Crew. Late in the afternoon of the next day while the *Munroe* was gone to Bell Sound taking Mangham to visit his father, employed as head of the Mansfield Development Company, the *Irma,* a whaling-steamer, arrived and anchored near the the engineer's house. The manager came ashore and asked permission to send back to Norway on the *Munroe* a shipwrecked crew of nine men. In such cases the Norwegian Government pays for board, lodging and transportation. These unlucky mariners had belonged to one of the whaling gunboats of the *Irma.* On July 1 a whale which they had harpooned had struck their boat with his head and it was stove in and sank in a few

minutes. The men themselves, saving only their clothing, had escaped in a lifeboat, rowing for three days through the ice-fields before finding the *Irma*.

These men were made welcome, and as they expressed a desire to work, they were put on the pay roll. The engineer was a timely acquisition: he was able to give assistance in fitting the launch with an engine and boiler.

4. THE WELLMAN CAMP

At this time Walter Wellman, the American aeronaut, had established himself on Danes Island with his big dirigible airship. Mr. Longyear knowing that he had there a considerable plant—machinery, lumber, and buildings—thinking that he might be willing to dispose of it after he had finished with it, decided to take the *Munroe* and visit the establishment. He would have liked to wait till later, and possibly be there in time to witness the departure of the *America* for the North Pole; but this was the only oportunity that offered, and he started at half-past three in the afternoon of Saturday, July 6. He was accompanied by Gilson, Street, and Miss Brigham.

A Visit to Wellman. Seven hours later, off Prince Charles's Foreland they met Herre Iversen's three whaling-steamers, *Fin, Frey* and *Star,* which had been in Safe Harbor during the unloading of the lumber there. These vessels had fourteen whales in tow, taking them to Green Harbor. At seven o'clock the next morning they were passing the Seven Ice Mountains—"bleak peaks sticking up thru a glacier which must be ten or more miles long, dividing it into eight separate streams where the ice comes to the sea, but behind the peaks the ice is continuous." At eleven o'clock they arrived at the camp of "the Wellman-Chicago-"Record-Herald" North Pole Expedition, and ran up their flags, which brought out "Old Glory" from the flagstaff on the island. Mr. Longyear thus relates his experiences at the camp:—

Mr. Longyear's Relation. "We landed, and were met at the landing by Major Hersey and some of the others and

PIKE'S HOUSE, DANE'S ISLAND. USED BY ANDRÉE AND WELLMAN

ANDRÉE MONUMENT AND WELLMAN'S "HANGAR"

conducted to the house, where we met Mr. Wellman, Dr. Fowler, Mr. Vanniman and others. After a chat we were invited to 'see the sights of the place,' and Major Hersey and Mr. Vanniman showed us about. We saw the machine-shop first. It is a low building built on Gothic arches of wood with a long window on one side where the work-bench is. On the floor were parts of the 'serpents.'

Arctic Serpents. "These are tubes made of oiled silk covered with water-proof leather with overlapping scales of sheet iron, riveted on one edge, the loose edge overlapping rivets of the next scale. This is the 'Gliding Serpent.' The other is the 'Scratching Serpent,' which is covered with long scales, the edges being turned outward, and forming points like large saw-teeth—six teeth on each scale. The scale is three inches long, and the teeth are about an inch long.

"These Serpents are filled with provisions as a reserve, and will hold enough to supply or feed the party eight months, and are in addition to the forty days' supply that will be carried in the car of the balloon. The Serpents will be suspended from the bottom of the car, and will act as ballast. The lower ends can be raised or lowered as desired. When high in the air and everything is going satisfactorily they will hang down perpendicularly. If slight retarding is wanted, the balloon comes down near the ice and the gliding Serpent is dragged along its surface. If strong head winds are met and a stationary position is desired, the Scratching Serpent is let down and with its thousands of teeth cutting the ice will hold the balloon where it is or nearly so. Each Serpent, filled with supplies, will weigh about twelve hundred pounds.

The Balloonhouse. "The balloonhouse is made of arched wooden trusses, and is about eighty-five feet high, and perhaps two hundred feet long by one hundred feet wide. The arches are connected by bridges or wooden trusses, and the whole is covered with canvas like a huge tent. On the Fourth of July a gale blew down half of one of the trusses, and this will cause a delay of two weeks in their preparations. Mr. Wellman had expected to make the trip about August 1.

THE NACELLE. "The 'Nacelle,' as the car below the balloon is called, is a marvellous piece of construction, and shows a remarkable amount of study and ingenuity. A steel tube or tank, one hundred and sixteen feet long and two feet in diameter, to hold the gasolene, is the base of it. The tank is divided into sections so that, should any accident happen to it, only a part of the gasolene would be lost.

"Above it is a spiderweb-like construction of steel tubes of wonderful lightness and strength, and of wires. The seventy-horsepower gasolene motor and the propeller fans are in the center, and around it are the quarters for the crew and the dogs, and place for the sleds, boat, provisions, and the like.

"Experiments had proved that the hydrogen gas with which the balloon would be charged, would run the engine as well as gasolene. So, as fast as the weight is taken from the tank and the car becomes lighter, if it should rise higher than was desired, the gas could be taken from the envelope and burned in the motor, instead of being wasted as is usually the case. As soon as the buoyancy was properly reduced the engine would be switched to the gasolene again. The balloon contained enough gas and gasolene to make the trip to the Pole and back twice.

"A dog sledge, inverted and sliding on guides overhead, will be loaded with provisions for the party for twice the length of time it was expected the journey to the Pole would last. This would be used for adjusting the balance of the balloon, as it could be slid back and forth on the track which runs the whole length of the nacelle, and placed in such a position as would keep the car level.

A VERSATILE EXPERT. "Mr. Vanniman, the expert, who explained it all to us, is an American who has been an opera singer, an expert photographer, and an aeronaut. He told me that he made and used a camera that took photographs sixteen inches wide by four feet long. He is building an aeroplane in Paris which he is sure will fly. He said that he would never have left it for the Wellman expedition if he

had not been sure that the trip to the Pole could be accomplishd with certainty of success. He was at first consulted as an expert, and before the winter was over the balloon was practically all of his designing, and the nacelle all of his designing. Then he felt bound to demonstrate its success, and he is here and will go with the expedition."

Particulars regarding the failure of Wellman's attempt to reach the Pole are given in the earlier pages of this book. When Mr. Longyear learned of the abandonment of the plant, he made an advantageous offer to purchase certain parts of the plant for the use of the Arctic Coal Company. Wellman replied that it would be satisfactory to him, and he would refer the matter to his principals who would take up the matter when they were done with the outfit. Nothing ever came of the proposition.

The Andrée Establishment. Only a short distance away from the Wellman establishment the pathetic remains of the Andrée balloon expedition were still visible. His house was used by Wellman's carpenters and other workmen, and just behind it were the ruins of Andrée's gas-house, from which he inflated his balloon. A llarge part of his balloon-house was utilized for building foundations for Wellman's hangar.

On the mound of rock, amid the fragments of the old building Mr. Longyear found the twenty or thirty dogs which Wellman had. They were such fighters that they had to be kept chained, so as not to get at one another. "They are all trained sledge dogs and no two look alike. They are of all colors found in dogs, and the wild chorus of barks and yelps with which they welcomed us was deafening."

Mr. Longyear also visited the monument which he describes not as an obelisk but as "a cairn of stones, surmounted by a Swedish flag painted on sheet iron upheld by an iron staff, and an inscription recording the fact that Andrée and his balloon left this spot, and giving the names of his two companions. The remains of the crate in which Andrée's balloon arrived here lies near the house."

5. RELICS OF ANCIENT DAYS

In the afternoon of the same day Mr. Longyear and his friends went across to the site of Smeerenburg, which being interpreted means greasetown or blubbertown. He says:—

"The eastern part of Amsterdam Island is comparatively flat and level, and here in the seventeenth and eighteenth centuries was the largest whaling-station ever known to that industry. It was established by Hollanders, and was for many years an important point. In the summer it is said to have had a population of more than twelve hundred, and there are still remains of numerous boileries where the whale oil was extracted from the blubber. There were much fighting and lawlessness, and many tragedies. There had been many hundreds of graves scattered about over the plateau, but most of the bodies had been buried hastily and not deep, as the labor of digging below the frost was very great. As a result most coffins were brought to the surface by frost action. For many years the locality was famous for its many gruesome sights. Graves which had been made deep enough so that the frost was permanent were undisturbed; that is, the coffins did not rise to the surface and the bodies also were preserved.

Grave of a Russian Officer. "Captain Naess told me of opening one grave on Norwegian Island, in 1896, when he was pilot for Baden-Powell's Solar Eclipse Expedition. This was the grave of a Russian officer who had been buried in his uniform in 1736, according to the plate on his coffin, and except that the flesh had turned black, the body looked like a man asleep. He also mentioned having examined the grave of a woman in Holland costume, white cap, etc. Those graves he always took pains to refill and secure in the usual way, by piling rocks on them to prevent their exhumation by bears and foxes, but when he visited the place in 1896 with Baden-Powell, someone had apparently opened and neglected to secure the grave of the woman. The grave was open and the bones were scattered about the place, the flesh having apparently been eaten by animals.

"In 1906, the year before my visit, the Government of Holland had sent an expedition to Amsterdam Island. This expedition gathered into a pile all the human bones that could be found, the intention being to remove them to Holland and give them burial, as they had been citizens of that country, but no one could be found who would take the contract of transporting the bones to Holland. The pile was therefore covered with boulders and tablets were erected over it."

The inscriptions will be found in the first part, as copied by Dr. Hergesell who compared the great tumulus to a Hünengrab.

6. A TRIP ALONG THE SHORE

After a cheerful dinner-party given by Wellman that evening, Mr. Longyear and his companions returned to the *Munroe*. It was foggy, and a light snow was falling. A few moments later the anchor was raised, and they sailed out toward the ocean, whistling salutes and dipping flags as they went. At five o'clock in the afternoon of July 8 they arrived at the whaling-station at Green Harbor on the east side. Here they were shown all the processes of flensing whales and boiling blubber, and were presented with a big piece of meat from one of the twenty leviathans—a herring-whale—that were waiting to be cut up. The whalers were expecting to salt and pack for the Russian army two hundred barrels of this excellent meat.

Land Claims. Under Mr. Longyear's instructions Munroe had put up claim-posts on tracts of land in Sassen Bay, on Cape Boheman, and at Green Harbor in the summer of 1906, and Ayer and Longyear had filed at the State Department maps showing their claims in Spitsbergen with detailed accounts of their operations there. Mr. Longyear's idea in locating on Sassen Bay had been to secure the formation which he had seen when the *Ausguste-Victoria* went there from Advent Bay in 1903. When he took his photographs of the formation he supposed they were in Sassen Bay as the ship's bulletin had published that as the next stop. The truth

was the ship was in Bjona Havn, a branch of Sassen Bay, on the northwest side, at the east end of Temple Mountain. Munroe's stakes were established on the south side of Sassen Bay, where the shore is comparatively low.

Renewing Inscriptions. Mr. Longyear and his party went up to the claim post, and renewed the inscriptions. On the way back they came to a stretch of soft, miry clay about one hundred feet wide, and found that the most feasible way of crossing it was to plunge through it by the shortest cut. Mr. Longyear and the three other men found no great difficulty, but Miss Brigham, who could not walk so fast, sunk in above her shoes at every step. When they emerged on the shore side they all looked as if they had been wading in yellow paint. On the beach they found a dead shark more than six feet long; its mouth which was too small for a man-eater's, was provided with several rows of small sharp teeth.

The steamer then ran down to Russian River Point (also called Cape Starashchin) on the east side of Green Harbor. The weather being calm they did not anchor, and Mr. Longyear and Gilson were rowed to the shore and along the shore. The rock-formation was well exposed, and at several places they noticed a good looking seam of coal at the water's edge and succeeded in getting a sample of it. Above the water it was covered with ice and could not be examined.

Coal at Green Harbor. They landed and saw a seam higher up where Neilsen, a Norwegian, who had claimed two or three square kilometers of the Ayer and Longyear property, had done some digging. Everything was so cased in ice that not much could be judged beyond the fact that there was coal there. They discovered that the manager of the English Company had also located a claim in behalf of the English Company covering all of Neilsen's land as well as Ayer and Longyear's as far as Coles Bay. There was an abundance of unclaimed coal-bearing land all over Spitsbergen, and it seemed rather audacious in the Englishman to override the regulations of decency. After returning to the ship they proceeded to Coles Bay and came to anchor there

TYPE OF CLAIM-POSTS USED BY THE AMERICANS

HUNTER'S SOD-COVERED HUT, COLES BAY

about midnight. At breakfast they had delicious steak, and all on board ate bountifully of it—not until it had disappeared realizing that it was whale steak!

They landed on the shore and visited a sod-covered hut which had been built by a hunter on their property two years before. Other hunters had used it the previous winter—the same ones as had left such an indescribable mess around the hut at Safe Harbor. Here it was even worse. Mr. Longyear says:—

Filthy Huts. "There was at least a wagon-load of old meat a few feet from the door, bodies of foxes—two white ones—with the skins still on, chunks of bear-meat, feathers, dead birds, etc. Inside a pile of mouldy reindeer-meat and dirt inches thick; eight reindeer skins hung on the walls spoiling. As they were probably left by the hunters last winter (they used the hut as a warming station), and as they would spoil if we left them, we took them away with us. These skins are of no market value."

Mr. Longyear with Captain Naess and Gilson walked a few miles along the beach and visited their boundary-posts at the head of Coles Bay separating the Ayer and Longyear lands from the Arctic Coal Company's. The beach gravel was filled with pieces of coal which seemed to point to an abundance of the mineral in the neighboring mountains. It had been misty weather, the sun fighting with clouds of fog which hung over the peaks. But while they were there the wind blew them aside, and though they were in shadow the mountains east of the bay became visible, glittering white with freshly fallen snow which looked like "huge lace coverings."' The sun in half an hour had entirely dissolved it.

At Cape Boheman. They returned to the ship at three in the morning, and at six the *Munroe* sailed north through Ice Fjord to Cape Boheman, where they had to anchor two miles off shore on account of the shallow water. At nine in the morning of the 9th Mr. Longyear with Captain Naess, Gilson and Street, were rowed ashore by two sailors, and visited a hut built by Neilsen who claimed a part of the Cape.

They found it well built, and quite clean as it had not been occupied by hunters. Mr. Longyear thus describes the coal-conditions on this part of their property:—

"The seam of coal here is almost at the water's edge, and the low point does not appear to cover it with much depth anywhere. Probably it is all frozen, and if so will not be worth much until it is wanted for coking. The west end of our property extends into the hills west of the long low point on which we were. We went partly by boat, and partly by walking two or three miles west along the south shore of the cape, and saw indications of the coal-seam everywhere, although the best exposures, to which Naess conducted us, were covered with ice.

Coprolites in the Shale. "At one place for a long distance, just above the shingle beach at low tide, and washed by the water at high tide, is a vertical bank of soft shale from six to ten feet high in which are embedded nodules of hard rock. These are mostly spherical, but many have the shape of pears, potatoes, and other fruits. Many are long like bananas, sweet potatoes, and the like, and many are of curious shapes unknown to my knowledge of fruit and vegetables, although these things are known as 'fossil fruit.' I took all I could carry in my pockets and hands. The long ones are always standing upright in the shale, and, as the strata of the shale are horizontal, the frost in breaking the shale breaks the 'fruit' into many pieces. The round, pear-shaped, and like forms, are generally intact, and are of sizes from grapes to several inches in diameter."

These nodules were coprolites, the petrefied excrementa of prehistoric saurians, and are very heavy. They are found also in England. When ground into powder, they make excellent dressing for the soil. Analysis of the Spitsbergen samples did not show sufficient phosphorus for fertilizer uses.

They saw a snipe's nest with four eggs, and, on some small islands which they visited on their way back to the hut, they found large numbers of eider duck nests. Gilson shot four drakes, and Captain Naess took eighteen eggs. As they

had no basket the eggs were put into the bottom of the boat and were promiscuously walked on, making an omelet which no one cared to eat!

After a three o'clock dinner the *Munroe* proceeded to Temple Bay, passing on the way Cape Thordsen where, in 1870, Nordenskjöld built a village of eighteen houses, when he was engaged in his disastrous enterprise of mining a fourteen inch wide vein of fish guano. The houses, deserted after the ill-considered enterprise failed, had been gradually carried away piecemeal until only three were left, and those were occasionally used by hunters. The crew of men left here by Nordenskjöld to over-winter all died of scurvy before spring.

Beautiful Temple Mountain. Mr. Longyear gives a charming picture of the beautiful Temple Mountain at the entrance to Temple Bay: "This mountain is horizontally bedded with different-colored strata, and is cut by thousands of vertical gullies of many different lengths. This gives it the appearance of a high building, two thousand feet high and two miles or more long. Many little turrets, towers, and roof-like piles of slide rock, add to the house-like features. When we turn the corner and enter Temple Bay this effect of a building is continued for a mile or two up the side of the bay.

"At the head of the bay is the Post, or Temple, Glacier. As the water is deep right up to the two hundred foot ice-cliffs at the face of the glacier, we ran the ship to within its length of the ice and took photographs. Masses of ice were continually falling, and the water was covered with floating ice and icebergs from the glacier. We saw no great masses of ice fall, as we hoped.

"The steamer now ran to the south shore of Sassen Bay where we found the *Eric Jarl,* with the German Professor's party, at anchor. We went ashore, and while Naess and I looked at the hut built by us last year, and at one of our claim-stakes, Gilson shot a reindeer he had seen coming down the hills back of the landing-place.

Indications of Iron. "The beach here has no coal at all in the gravel, but I saw a lot of black jasper, white and red

quartzite, etc. If I saw the same on a beach at Lake Superior I should say they came from an iron ore bearing formation. There were also gravel and shingle from the fossiliferous limestone, a bluff of which stands at one side of the beach, and on which our claim stakes stand."

They returned to the ship about half after one in the morning of July 10, and as the vessel steamed along the front of the Sassen Bay property Mr. Longyear studied its formations for an hour or two, and then turned in. When he awoke about eleven-thirty in the forenoon the *Munroe* was at anchor in Advent Bay.

The First Load of Coal. The next day the ship with a lighter in tow ran over to the English camp to borrow some rails, and on returning took on the first load of coal to go over the new dock. They all spent the night at the engineer's house, and on the way saw a flock of hundreds of eider ducks flying near them. In the evening Miss Brigham varied her activities in furniture making by preparing eider drakes' breasts for use as furs. Only the male eider is good for this purpose, as the ducks pluck the down from their breasts to make their wonderful nests. The larger feathers on the neck and underside of the body are pulled out, leaving the soft down so much prized.

7. BACK TO NORWAY

On July 12 the *Munroe*, fully bunkered with Advent Valley coal, her larder enriched with loaves if not with fishes, with pies, and with other delicacies prepared by the camp cook, sailed away at four o'clock in the afternoon. When she reached Safe Harbor a motor boat belonging to a whaler came out, bringing an officer of the Norwegian army, who was obliged by his duties to leave behind him with his father a big whale-boilery he owned, and return to Norway. He desired passage, and was welcomed with characteristic generosity and courtesy. Outside the Ice Fjord lay a mighty field of ice but fortunately it was a good deal scattered and the steamer by skilful maneuvring sailed through it in about three hours. It

consisted of fragments of all sizes even up to bergs hundreds of feet across. They met a school of fifteen or twenty seals swimming rapidly along, as if in a hurry to reach the end of some journey. Some of them would actually leap completely out of the water. Of the scenery Mr. Longyear says:—

Last Views of Spitsbergen. "The last views we had of Spitsbergen were of the most glorious description. The sea was as smooth as a pond. The receding hills were cut into horizontal slices by ribbons of fog. Along the northwest horizon were wide level streaks of pinks, yellows, and grays, illuminated by the invisible sun, all reflected in the smooth water, making cold, barren Spitsbergen look like the gates to Glory."

The next morning the engines suddenly stopped and the captain announced that the cause was thick fog and heavy ice, through which the ship had been zigzagging for hours toward the northwest, seeking for an outlet. When the fog settled down more densely than ever it was impossible to keep even dead reckoning. About noon a dark object was seen looming through the gray mantle, and the steamer was directed toward it. Soon the masts and smokestacks of three whalers developed. They were lying side by side, and proved to be Herre Gjaever's *Dovre,* with the two gun boats, *Carl* and *Mathilde* which as the drift-ice came down upon them from the north had retired from the hunting off Prince Charles's Foreland, but had been caught in it, unable to escape. The *Munroe* had on board the shipwrecked sailors who had been picked up by the *Carl.* The perfect smoothness of the water, undisturbed by even the slightest swell, indicated that heavy fields of ice were in all directions around them.

When the fog lifted a little about noon they skirted the ice-field in a course east by northeast, and could occasionally see the Foreland through the rifts in the fog. As it settled around them thicker again they sailed slowly north, then northwest, and about half-past ten turned west and met quite perceptible swells, showing that they had reached the western limit of the great ice-fields. After midnight they had eight

hours of open ocean, allowing them one more to proceed to the southwest.

At eight o'clock the next morning they fell in with another barrier of ice stretching across their way as far as they could see, but fortunately it was not solid, and with many bumps and turnings they passed through it in about an hour. Another interrupted them about noon curving away to the west, northwest, and north. This they skirted for another hour, and finally managed to push through it and emerged into the open Arctic with a free course to the southeast, but they were about as far south at eight o'clock in the evening though fifty miles or more to the west as they should have been the 13th, had it not been for the ice and the fog. The vessel being in ballast was high out of water and rolled considerably as the sea increased. Everything loose developed an ambition to chase itself across the deck or around the staterooms. The sailors had been utilizing their leisure time in freshening up the ship, and both Mr. Longyear and Mr. Street had several times to visit the steward's gasolene can to remove the traces of too great intimacy with white paint.

Yachts in Tromsø Harbor. They reached Tromsø Harbor, "with a savage wind following from the north." There would have been a wild sea if they had been a day later. The harbor was quite gay with visiting vessels: an English yacht flying the flag of a Bishop, a fine French yacht, the *Salvator,* traveling in company with the *Princesse Alice* belonging to the Prince of Monaco, and their *avant-garde,* the little Norwegian steamer the *Koedfjord,* a steel boat of light draft used in trying out doubtful places where the coast is not mapped.

They had hardly anchored and swung round in the tide when launches came to them from the *Salvator* and the *Princesse Alice,* bringing visitors and officers to inquire about the ice-conditions in the Arctic Ocean. Among those that came from the French yacht were two young girls who "asked a lot of intelligent questions about the ice." They had been as far as the North Cape three days before, and turned back be-

S. S. "MUNROE" AT POST GLACIER

FRONT OF POST GLACIER, TEMPLE BAY

cause of the masses of ice which had blocked their way. They were expecting to go to Advent Bay.

Mr. Longyear and others went ashore and posted innumerable letters, and sent many telegrams. When they returned to the ship the wind was still blowing a gale down Tromsø Sound. A little later Captain Naess's brother, with his sister and his fiancée, came aboard. Mr. Longyear says: "As they were getting into the bobbing boat at the foot of the stairs the brother's stiff hat blew off, almost immediately followed by that of his fiancée. It was very amusing, to a spectator, to see the maneuvers of the boat and its occupants in recovering the hats from the tumbling waves. The lady was very much afraid of the water anyway and sat in the stern of the boat clinging to the Captain's sister. When the hat was lifted from the waves it brought up a quart or so of water, and as it was tossed into her lap the water poured over her in a small cataract, causing her to yell so that she might have been heard a mile. She did not seem to enjoy it much, but her friends did."

The storm raged all night, and in order to take on coal the vessel had to move into the inner harbor where a lighter could come alongside. It took the deliberate Norwegian coal-merchants and stevedores twenty-eight hours to bunker fifteen tons. At eight o'clock in the evening, when they were preparing to start for Trondhjem, they found their anchor was foul of another chain, and it took an hour to disengage it. Close by them was a fine American yacht, the *Wakiva,* flying the pennant of the New York Yacht Club. As they went out the *Munroe* blew three whistles in salute, and ship and yacht dipped their colors.

That afternoon the *Salvator* and the *Princesse Alice* left for Spitsbergen, and the English Coal Company's steamer, the *Daggery,* was on the point of following them. The German Kaiser and the King of Siam had been at Tromsø the week before, and the King of Norway was expected the next Monday, so that the streets wore a gala aspect.

Two of the men from Spitsbergen went ashore, and made

too intimate acquaintance with Tromsø whisky. They were so disorderly in their drunkenness that they were arrested and lodged in jail. Finness, one of the other men, went to the police and generously offered to pay their fines if they might be set free, but the officers refused the money and were inexorable in compelling them to serve out their sentences in jail.

Imperial Honors. The steamer reached Trondhjem about seven o'clock on the morning of Sunday, July 21, and were received with imperial honors by the German Kaiser's yacht, the *Hohenzollern,* and eight warships and cruisers anchored outside the breakwater, and seven torpedo boats inside. As the *Munroe* passed through their midst with her flags flying this great array responded to their salutes by "dipping" their colors.

A Demoralized Town. The town was very gay, the streets full of German "jackies,"—hundreds of them all in uniform—marching to the music of bands, and every girl attended by one or more admirers all conversing in sign language. The story was told of one Trondhjem girl who engaged herself to a German sailor when the fleet was there the year before, not even knowing his name. He knew hers, however, and had just hunted her up. Whether she went to Germany or not the story did not divulge. The town was so disorganized by all these excitements that business was at a standstill on the following morning. Mr. Longyear went to the ship at half-past seven in the morning to see if the lading had begun, but the whole place was asleep until after eleven. Not until one in the afternoon was any beginning made. There were the usual difficulties in securing such articles as were needed at Advent Bay. Fire extinguishers were required, and Mr. Longyear and Mrs. Munroe went to a place where English was not spoken or understood. Mrs. Munroe succeeded in getting the salesman to comprehend that something associated with fire was wanted, and brought out in succession tongs, bellows, pokers, and coal scuttles, but no fire extinguishers. Ultimately it was found that in that wooden town, which had several times been destroyed by

fires, there was none to be had! Very few of the things needed at Spitsbergen were on sale in the Trondhjem shops, and whatever was especially necessary had to be fabricated out of raw materials, and even those were not always on hand.

Difficult Loading. The timber and machinery with which the *Munroe* was to be loaded for its next trip to Spitsbergen were so placed that no position of the ship enabled the cargo to be got on board without horses and men to bring it up. It required some one of common sense all the time to correct bungling errors. Mr. Longyear took all these peculiarly Norwegian exasperations philosophically, and with ample good humor; but he met at Cook's office an American "who was damning everything an inch high or a year old." He was a big blustering man who, when discovering that Mr. Longyear was a fellow-countryman, shouted out,

"Boston is the center of the pie-belt and about the best part of this earth. I'm from there! Are you?"

When Mr. Longyear replied that he had been there often, the stranger gave a rapid-fire opinion of the damned things he had been "up against" on that side of the water. It especially "got his goat" that he was always taken for an Englishman. He was a member of the Spitsbergen excursion on the Hamburg-American steamship *Blücher,* which had come into collision with the ice a few days before and been obliged to return to Norway with a hole thirty feet long in her bow.

Gibbs Engaged as Clerk. It happened that Gibbs, one of the English miners at Advent Bay, had been home to England and was on his way back. He was commandeered as a "checking clerk," and did his work so well that Mr. Longyear was freer to attend to other things—"walking and walking and walking on the endless errands."

By six o'clock in the afternoon of Friday, July 26, all the timber and the iron-work were at last stowed on board the *Munroe,* together with a vast amount of miscellaneous articles needed in a place where absolutely nothing was to be found to satisfy the miscellaneous wants of some hundreds of men in such a wilderness. Mr. Longyear noted that "it would be

a difficult thing to find or name anything that could not be used at the camp on Spitsbergen. He excepted only patent leather shoes and silk stockings!

All day long the bills had kept pouring in and quantities of checks were made out to settle them, and heaps of money was handed out to satisfy the *forskud* or advance pay to the men hired to work at Advent Bay. Mrs. Munroe and her friend Mrs. Shotwell had arranged to go on the vessel to pay a visit to Miss Brigham, but imperative business affairs recalled Mr. Longyear to America. He was satisfied that the enterprise at the mine was well started and in competent hands; he had no hesitation in giving over the personal direction of the business. He watched from the dock the departure of the vessel. As she passed through the opening in the breakwater, the flag was dipped four times in mark of special honor to the President of the Arctic Coal Company.

8. THE VIKING SHIP

The next day, after making final arrangements and paying various social calls on the hospitable friends who had entertained him, he departed for the south.

A Billiard Table for the Camp. He was desirous of sending up to Advent Harbor a billiard table to while away the monotony of leisure hours, but he found Trondhjem as devoid of them as Tromsø was devoid of fire extinguishers. At one establishment he was confided to the tender mercies of a young woman claiming to speak and understand English.

"Oh, yes," she exclaimed vivaciously, "we have them. This way, please!" She led the way up three flights of stairs and triumphantly displayed a line of fine table-cloths! As these did not "fill the bill" the establishment was next ransacked only to bring forth various other kinds of table covers. It was evident not only that they had no billiard tables, but also that they had not the slightest notion of what was wanted. Mr. Longyear had to wait till he reached London before he obtain one, and then the zinc-lined crate in which it had to be packed cost half as much as the table itself! At

PART OF THE FISHING FLEET IN TROMSØ HARBOR, COAST OF NORWAY

YACHT OF THE PRINCE OF MONACO, THE "PRINCESSE ALICE"

Kristiania he spent some time at the National Art Museum but felt too sleepy to get much satisfaction from the pictures. He wrote that he was "like a rope that had been under tension" and with the load suddenly removed found a good deal of "slack" or "sag" in it. He gives in his diary a very interesting account of a Viking ship which had just been put on exhibition at the University of Kristiania:—

The Viking Ship. "The antiquarians are able to give it a date of about A.D. 800, so it is now about eleven hundred years old. Like the Gokstad ship, also on exhibition nearby (which I saw four and six years ago), this one had been used as a sepulcher, and the mound over it being of clay, it was almost prefectly preserved from decay by being hermetically sealed from the air. But the settling of the mound had crushed it badly. However, the more than two thousand pieces into which the boat and its timbers were broken were carefully gathered and numbered, so that every piece was refitted to the place where it belonged. Many of the planks had been twisted out of shape by the crushing of the boat, and their long rest in those positions had given them shapes different from those occupied in the original structure. The oakwood (of which all the ribs and plankings were made) was so sound that it was steamed and put back into its original shape and place in the boat. It is a remarkable work of restoration, and of patient, painstaking fitting together, so that the original structure now stands and looks almost as it did eleven hundred years ago.

"It was the property of a princess, or queen, and was also her sepulcher, with that of a maid servant (who was probably killed to go and wait upon her mistress in the other world), dogs, horses, cows and other household treasures. A lot of other things found in the ship have not as yet been arranged for exhibition, so I did not see them.

"The curved bow and stern posts were finely carved, but the high ends of both, as with the Gokstad boat, are gone. They probably became exposed to the air and rotted away. The boat was put together with the same kind of clumsy rivets

they use in building boats in Norway now. In Norway they do things in the same old ways just because they always have been done in those ways. A common saying is, "The old people did it that way and they knew."

At Shakespeare's Elsinore. On the through-train from Kristiania to Copenhagen Mr. Longyear was wakened from his sleep at Helsingor, Shakespeare's Elsinore, "within a few rods of the place where Hamlet's father's ghost called him." "But," he says in his journal, "it was no ghost that called me. It was a smiling fat conductor without a sepulchral tone in his voice." He saw a bicycle named "Hamlet," and laughed to "think of the 'Melancholy Dane' 'scorching' along an ancient highway."

With two narrow escapes from losing trains, owing to the stupidity of porters, Mr. Longyear reached Liverpool on the very day when that venerable city was about celebrating the seven hundredth anniversary of its founding. The *Bohemian,* of the Leyland line, sailed only an hour before the great historical pageant was to take place, and of course it was impossible for him to witness it. He landed in Boston on Wednesday, August 17.

VI. THE QUESTION OF COAL-TRANSPORTATION

1. THE RESCUE OF DR. BRUCE

MR. GILSON had been left in charge of the various activities at Advent Bay with the usual result that some friction developed, due partly to the commonly observed effect of a new superintendent, partly to the new superintendent's overanxiety to make a good record, and partly to overstrain and overwork. Letters calculated to fan these disagreements into a conflagration were written to Mr. Longyear. He was informed that Mangham was proposing to leave; that the Captain threatened to quit the ship at the end of his trip; that Baever, the German engineer, sent to erect the tramway, would not come back the next year; that Saether had handed in his resignation; and that other calamities were impending.

Mr. Longyear did not take these reports seriously, and wrote letters that served to quell the incipient flames. Saether did not resign—in fact had not intended to resign; the Captain was well satisfied with his job; if Baever was not going back, the reason was that he had finished his work. Nothing more was heard of the other complaints. Gilson remained with the Arctic Coal Company for nine years as superintendent-engineer, and at the end of that time received a substantial gift of money, and a handsome testimonial for his faithful and indefatigable services.

MULTIFARIOUS ACTIVITIES. His monthly reports to the Arctic Coal Company show in detail what was accomplished in getting all the multifarious apparatus ready for the practical work of mining. These operations were a good deal hampered by the failure of certain parts of the material to arrive. The towers for the aërial railway could not be

framed while the round timbers were still at Trondhjem; but the masons were engaged in laying the foundations, some of which had to be made very solid in order to assure perfect stability. There were also a number of buildings in process of construction, such as the storehouse, the coal storage pocket, an eating house, and smith-shop on the mountainside near the mine, and a winter magazine to take the place of the one that had been destroyed by a large rock falling upon it from the cliff during the summer. A small hunting house also had to be built about fifteen miles up the valley in order to provide the winter supply of reindeer meat.

Local Coal-sales. Considerable coal was taken out from the mine, and as many whalers and other ships had been disappointed by not having their orders filled by the English Company, they applied to Gilson to help them out. Captain Jarner, a German, bought eight tons, and a few days later came back for ten tons more, reporting that he could steam a half sea-mile faster with the Advent coal, and offering to give a written testimonial. Captain Bryde, also one of the most important whalers in Spitsbergen waters, came over and bought forty tons. He was so much pleased with it that he sent another large whaler, Captain Marcussen, from Safe Harbor, who took seventeen tons and wanted to engage sixty more for the following summer. Altogether more than two hundred tons were thus disposed of, besides the sixty consumed on the *Munroe,* and it was planned to bunker enough on her last trip to start out with the following season. All this coal was taken down on the "Jinny," so as to enable the up cars to carry sand and other material for the masonry work at the mine and on the aërial towers.

The expense of running the supply ship was found to be surprisingly large, and Gilson criticized the Captain for some of his purchases which seemed to him extravagant, but on examination most of the items proved to be necessary or at least justifiable. Every captain feels an honest pride in having as fine an equipment on his boat as possible. Captain Naess was no exception.

Dr. Bruce's Peril. One rather big expense into which he involved the Company was incurred during the final trip of the *Munroe* up to Spitsbergen. Dr. W. S. Bruce, a Scottish scientist and explorer connected with Edinburgh University, had been for two years engaged in surveying Prince Charles's Foreland. In August, this year, he had sailed away to the North in his small boat, with four men connected with the Isachsen Expedition and, as nothing had been heard from him, his assistant, Captain Hjalmar Johannesen, stationed at his base camp, began to grow alarmed lest he had met with some disaster. An arrangement was accordingly made with Captain Isachsen of the Norwegian Cavalry whereby the steamship *Kvedford* should be on the east coast of the Foreland between August 28 and September 1. When Dr. Bruce arrived there on September 5, Captain Isachsen had sailed for Norway, after arranging with Captain Ericsen of the whaling sloop *Johannes Bache,* to stand by until the 16th. In case Dr. Bruce reported before that date, Captain Ericsen was to proceed to Advent Bay and announce the explorer's safety; but if he were still missing he was to engage the *Munroe* to go in search of Dr. Bruce.

Supposed to be Lost. A general impression prevailed that Dr. Bruce and his party were lost, and as the weather was threatening, and there was a prospect of winter's setting in earlier than usual, Captain Naess, who was well acquainted with the dangers of the Far North decided that if anything was to be done, no time was to be wasted, and, without authority, put to sea in search of Dr. Bruce. He spent more than forty-eight hours in extremely bad weather at an expense of about four hundred and forty kroner, not including the loss of an anchor and twenty-two fathoms of chain. The lives of those on board as well as the vessel itself were seriously jeopardized.

A Misunderstanding. It happened that the *Munroe* arrived at the Foreland anchorage just as the *Bache* was on the point of sailing for the Ice Fjord—a day before the agreement had called for beginning the search. There seems to

have been some misundertainding, for when Captain Naess, aided by the chief engineer and the Arctic Coal Company's clerk at Trondhjem, made out a claim for an indemnity of two thousand kroner, Dr. Bruce's solicitors at Edinburgh replied that such a charge was "ridiculous" and refused to pay it, though they expressed themselves as willing to settle for the cost of the trip of the *Munroe* from Advent Bay to the Foreland and back at the request of Herr Lerner to fetch Captain Johannesen and they thought that Dr. Bruce, who was absolutely blameless in the matter, was more than generous in making this concession, as he was already seriously out of pocket by reason of three summers' explorations. Captain Naess had made the trip at the urgent request of Dr. Bruce's agent who had assured him that all charges would be paid.

Dr. Bruce Refuses to Pay Charges. There was considerable correspondence about the matter but the Coal Company's claim against Dr. Bruce was not taken into the courts, the amount being too small to warrant the expense. The "Lokal-Anzeiger" of Berlin promptly settled for supplies furnished to Lerner, its correspondent, and Lerner, who was desirous of securing the services of Captain Johannesen for the following winter, stated that Dr. Bruce would pay for the second trip. Captain Johannesen wrote a letter to one of the Norwegian papers giving Captain Naess and his crew high credit for the efficient manner in which the search for Dr. Bruce had been conducted. Captain Naess laid up the ship for the winter and was engaged to take care of it while it was idle.

2. F. P. BURRALL ENGAGED AS GENERAL MANAGER

Shortly after the opening of 1908 Mr. Longyear learned that his wife's nephew, Frederick P. Burrall, a graduate of the Michigan College of Mines, who had had sixteen years of actual mining experience though not in actual coal-mining was free to accept the position of general manager for the Arctic Coal Company, and for the European interests of

FREDERICK P. BURRALL

Ayer and Longyear. In view of the salary offered and of the contingent interest in the profits, which promised to be considerable as soon as the production should reach a total of two hundred thousand tons a year, it would be the chance of a lifetime. He furnished Burrall with a carefully-drawn letter of comments and suggestions, based on his own experience in dealing with the peculiar problems arising from the isolation of Spitsbergen and the business methods of the Norwegians. Among his recommendations were the following:—

Plans for Lumber. Lumber was to be procured at the best prices from the men who lived about fifteen miles back of Trondhjem, though it was possible he might make even better bargains at Arkhangelsk, contracting with sailing-vessels to bring the timber and take a return-cargo of coal. He suggested also that a saw-mill of their own might be advantageous, for then timber could be bought in the round and cut into the dimensions required. He thought Tromsø might be a more convenient base of supplies than Trondhjem as it was about six hundred miles nearer Advent Bay.

In regard to transportation, which was proving to be "one of the most troublesome features of the business," he wrote:—

Safe Navigation. "The transportation companies, not having had much business with Spitsbergen traffic, seem to be fearful of dangers, which are really mostly imaginary, for the navigation, after leaving the coast of Norway, is much safer than that along the coast, with which the ship owners and masters are familiar; however, this difficulty will, of course, disappear as the ship owners and masters become more familiar with our business."

He thought Herre Albert Selmar, the manager of one of the best Transportation Companies in Trondhjem, and a stockholder in the Arctic Coal Company, would be helpful to him, although his interest in his own business was vastly greater than his interest in the Coal Company's. It was desirable to transport the coal in Norwegion vessels since foreign bottoms would have much larger harbor-dues to pay, and if they could not make satisfactory terms with large steamships, they might

engage Norwegian sailing-craft. But it was always possible that, failing the native vessels, English or German Companies would be glad to undertake the business. Herre Selmar had "advanced the idea with considerable positiveness" that their best method was to charter ships, but Mr. Longyear preferred to "let contracts to carry coal by the ton" and then, in due time, to acquire a fleet of their own.

Some Norwegians were not above petty graft. Mr. Longyear had discovered that certain of the oil companies were apparently offering commissions if employees insisted that no other oil was fit to be used on the *Munroe*. None of the other steamers running out of Trondhjem used these oils; so the matter of supplying the ship with the kind of oil customarily used by other companies was arranged, and Mr. Longyear came to the conclusion that matter was satisfactorily settled.

Mr. Longyear communicated much information regarding the coal-exposures already known, and advised thorough explorations, and tentative developments; also investigations into other valuable products that might be found in the comparatively unknown regions of Spitsbergen. He wanted as soon as practicable to have deep drill-holes put down through the entire formation. He wrote:—

Drilling for Coal. "Accumulations of slide-rock on the sides of the hills are very great, and this rock is all frozen together by ice which never melts, making it extremely difficult to clear a way for purposes of exploration and examination of the undisturbed strata; these strata, however, are exposed in some places; therefore it seems to me feasible to put a drill up on the tableland and bore at least one hole down through the formation, to water-level, in order to ascertain what coal-seams there are to look for. As the formation seems very regular, probably a line of holes, several miles apart, and extending from Advent Dale at the east end of our property to Green Harbor at the west end (a distance of about thirty miles), would be sufficient for the preliminary work. Such work will enable us to locate openings on the

sides of the hills with accuracy and understanding. We should also know which coal-seams to go after first."

Suggested Explorations. He suggested making explorations on both sides of Coles Bay where the beach gravel was full of coal-chips; exposures of coal had been located on the heights. He wanted explorations to extend north and south along the shores of Green Harbor and of the Ice Fjord shores toward Coles Bay. At Coles Bay a hunter had built a sod-covered house on Ayer and Longyear's property, and had caused considerable trouble by breaking into the hotel during the first year of its occupancy by the Arctic Coal Company, and stealing provisions and other things. The man had been arrested by the caretakers of the English Company across the Bay, who had exacted payment from him in furs. It was possible that this trespasser might appear again and create some trouble; so Mr. Longyear thought it might be wise to pay him a reasonable price for the house and take a receipt from him, in case he should appear.

He also recommended buying the Neilsen hut at Cape Boheman as it was well appointed and ready for use. Neilsen had done nothing for several years in the way of protecting his claim to a small area on the Point, nor was it of any special use to Ayer and Longyear; but if he could be bought off for a reasonable sum it might be well to do so, as he had tendered them, through Captain Naess, the use of his buildings and outfit. Mr. Longyear said: —

Coal at Cape Boheman. "The coal outcrops near the water's edge, not far from the hut; there is also a shaft in which coal was found a short distance west from the hut. The shaft was full of ice at the time I saw it, last July. Cape Boheman is a low, flat point of rock, several miles in length, five or six miles wide at the base. I imagine that the frost may have injured the coal here, as it did not seem to me, in looking at the formation, that the rock-roof over it is thick enough to protect it; however, this can be determined only by opening it in several places and making tests. Should it be found injured by frost it can probably be coked, and can be

kept for that purpose until we want it. There are mountains at the west end or base of the Point, which I did not visit, and it is possible that the coal-formation runs under these mountains, and if so would be less liable to frost disturbance. Later it was found that the frost had penetrated to a depth of more than eight hundred feet at Advent Bay, and that it did not injure the coal.

Locating a Channel. "There is an extensive shoal along the south shore of Cape Boheman which seems to be a mile or two wide. The north shore of the cape is not charted. No soundings have been made on that side of the cape. Captain Naess thinks that there is probably a channel across the shoal to a bay west of the Neilsen hut. Some work should be done by the explorers to ascertain whether there is such a channel. It will, of course, not be necessary to map it at present, but it will be well for engineers in charge of the work to make such rough sketches as will indicate it approximately.

"Naess also tells me that there are some small islands near the base of the north side of the Cape, and there may be a good harbor there. This also should be investigated and some idea of the depth of water on the north side of the Cape should be obtained by soundings and observation.

Coprolites and Guano. "A mile or so west of the hut, on the south shore of the cape occurs a bed of shale, in which coprolites are found. Similar shales in England have been found to be very rich in phosphates, and consequently are very valuable. Samples of these shales, coprolites, and the like, should be taken and analyses should be made. If these beds are rich in phosphates it may be found profitable for shipment to Europe."

In view of an Act of Congress introduced by Senator Lodge and actually passed by the Senate, Mr. Longyear's next recommendation has considerable significance:

"Auk Cliff stands on the west side of the entrance to Safe Harbor, on the north side of the Ice Fjord, west of Cape Boheman. The cliff measures about one thousand feet in height,

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and is a breeding-place for birds, mainly auks. There is a sloping talus at the foot of this cliff, probably one thousand feet in height, which from a distance, seems to be of fine rock and sand—débris from the cliff. Captain Naess tells me that this slope is very rich in guano. I suggest that, if opportunity offers, this be examined enough to get samples sufficient to determine its character, and if it is of value it may be well to establish a camp and claim at this point next year. I consider this of importance, and also the coprolite-beds for the same reason: because there is an Act of Congress providing that where islands belonging to no country, or parts of them, are taken possession of by American companies for the purpose of working or shipping guano, the land so occupied comes under the jurisdiction of the United States, and crimes, etc., committed on such territory during such occupancy are declared to be under the jurisdiction of the United States Government; therefore it may be important for us to have guano-claims, if such beds exist on Spitsbergen; even if they did not pay, they might be useful as a defense."

Minerals at Sassen Bay. With regard to Sassen Bay Mr. Longyear wrote:—

"A hut was built on our property here after my visit last summer, and Mr. Gilson can tell you about it. I landed on the beach near the middle of the property, and was somewhat disappointed in finding no coal in the beach gravel. I did, however, find some specimens that resembled some of the rock-formations in iron-fields I have examined in other parts of the world. It is possible there is iron ore here, but I do not think it wise at present to spend any time or money in looking for it, but I mention it so that the engineer in charge of the work at this point may keep it in mind, in order to note indications that he might see.* In sailing along the shore to

*In July, 1909, Adolf Hoel claimed a deposit of iron ore which he had discovered on Prince Charles's Foreland, and on February 3, of the same year, he informed the Department that he had "annexed a concurrence of Devonian fishes"—whether as an important asset to the whole industry or not, he failed to state. The same year Gunnar Holmsen claimed the discovery of a deposit of asbestos.

the west I became satisfied that if coal exists on this property it would probably be found toward the west, and in the hills back from the coast. I suggest that the search for coal here be confined mainly to the west end of the property, with perhaps excursions on the shore toward the east end, back into the hills."

Charges for Coal Furnished. Mr. Longyear's recommendation as to a general policy in dealing with vessels coming to Spitsbergen for coal was to charge at Norwegian prices, less the cost of transportation to Norway. Treating these captains generously he thought would assure the trade of all the whalers and win their friendship, which in such a region he considered an important asset. He was in favor of arranging to "grubstake" the trappers that wintered in Spitsbergen, on the understanding that the Company should buy their furs at a fair market valuation. By this means the hunting and killing of animals in that part of the island would be controlled, and the destruction of the fur-bearing and eatable animals might be curbed. Finally he informed Burrall that he had been corresponding with Wellman with a view to "taking over his plant, material, houses, machinery, etc., when he had done with his Arctic expedition."

Arrangements with Wellman. He said: "We should probably be able to buy this material at a very reasonable figure, as most of it will not be worth carrying back to Norway, and we can get it with the transportation of about one hundred and twenty-five miles, as against six hundred or twelve hundred miles for material brought from Norway. The engineer in charge of the work on Spitsbergen should perhaps be instructed to be prepared to go up and take an inventory at any time that Wellman may send him word that he is ready to dispose of his outfit. After talking with Mangham I wrote Wellman that we could use his trained sledge dogs also; they would probably be of considerable service to our camps, and it would perhaps be well to employ the man Wellman has had, who took charge of the dogs, and is an experienced man in that line of work; he could also probably take

care of horses, and do other chores about the camp. As the ship Wellman has been using, the *Frithjof,* was lost last Fall, he probably has no ship now, and in one of his letters he intimated that he might want to make some arrangements with us for transportation."

Nothing resulted from these negotiations with Wellman; we have already seen what a costly mass of materials he had left to the destructive elements, and to the rapacity of unscrupulous raiders. His financial backers would have been wise had they accepted Mr. Longyear's proposition, or even given him permission to take whatever he wanted from the relics of his unfortunate enterprise.

3. THE FROZEN STOCK-PILE

Burrall gave up his position as engineer for the Daly-Judge Mine at Park City, Utah, and arrived in Boston about the middle of March, 1908. From there he proceeded to Norway, reaching Trondhjem on April 12, and on May 3, at ten in the evening, he, in company with Gilson, two German Engineers, Leopold Pahl and Otto Schnabel, and the summer crew, sailed for the North. There was some vexatious delay at Tromsø, but they left there on the night of May 6. They encountered the first ice thirty miles west of Bear Island, but this was avoided by changing the course to the west. Then a fresh pack was encountered about halfway between Bear Island and South Cape, and was followed for about one hundred and fifty miles to the west of Ice Fjord, and when the ice trended away to the south, toward Jan Mayen Land, it became evident that further progress in that direction was futile; so the ship was headed to the east, and once got within forty miles of Spitsbergen; but the pack was still too solid to permit of penetrating it, and weather-conditions were also extremely unfavorable; so, after waiting a while for an improvement, the ship returned to Hammerfest to take on coal and fresh water. There it was learned that heavy winds from the northwest had prevailed during the spring and had driven unusual quantities of ice down from the North and

packed it against the west coast of Spitsbergen. During this enforced delay a precedent established by Munroe and according to Norwegian custom, obligated the company to pay each of the sixty workmen and two foremen two kroner a day in addition to their food. These men, as they were unable to secure liquor, were perfectly tractable and contented.

The *Munroe* sailed from Hammerfest on May 22 and arrived at Ice Fjord on the 26th, getting in as far as Coles Bay. The east wind which had been blowing for several days was driving the ice from the coast. Advent Bay was still filled with heavy winter ice which could not be broken by the vessel. They landed the cargo on the ice about three hundred feet from the shore opposite the hotel on Munroe Point. On June 2, the unloading was completed, the winter men were taken on board, and the *Munroe* sailed for Norway again.

The Winter's Work. Burrall reported that the work at the mine was proceeding satisfactorily and that the coal-seam was holding its average thickness of fifty inches, remarkably clean, with no dirt visible to the naked eye, and with constantly diminishing frost as the mine was pushed into the mountainside. The lowest winter temperature had been—34°.

Mangham, who had during the summer intimated to Mr. Longyear his desire to accept an advantageous offer of work in England, had nevertheless decided to remain in charge of the winter work at Advent Bay, and had experienced no trouble with the men. The miners had pushed the main-entry in about nine hundred feet, giving that length of wall-face as available for mining either by hand or by machinery. The coal from the winter's campaign had amounted to nearly two thousand tons and was piled on the shore opposite the dock, immediately available for sale.

Sales of Coal. Of this, one hundred tons belonged to Severin Dahl as exchange for a like amount, which had been freighted up to Spitsbergen for the whaling-station but had been used by the Arctic Coal Company; an additional amount of five hundred tons were contracted for to the same parties

at fourteen kroner, less two per cent cash. It was hoped also to sell three hundred tons to the Swedish Government which were to send a gunboat there during the summer of 1908. Besides these prospects they looked for a considerable trade with numerous whaling-ships which would absorb a good many tons. Mangham was counting on being able to produce rather more than ninety tons per day during the season. Activity had again sprung up at the English Company's mine, where the winter's output had amounted to a little more than thirty-five hundred tons, of a quality much cleaner than had hitherto been the case; and they had contracted to deliver six thousand tons to the Swedish Government at Narvik for use on the Governmental railways, at a price said to be sixteen shillings and three pence, (British).

During the winter the reindeer-hunting had been a complete failure, the moss around Advent Bay having been so deeply buried in ice that the animals could not get at it, and so had moved to the eastward. But seven blue foxes, three of exceptionally fine quality, and three white foxes, had been killed, and their skins would bring high prices.

Burrall returned to Norway on the *Munroe,* to superintend the loading of the vessel and make other arrangements.

A Varied Cargo. On June 18 the *Munroe* was ready to make her second trip of the season to Advent Bay. Twenty-one additional men were going up to the mine from Trondhjem, and it was hoped to secure fourteen more at Tromsø. The cargo consisted of the food-supplies for the summer, with hay and oats for the horses, spare parts for the Bleichert tramway, and the rest of the lumber and timber required for finishing the terminals. There were also over four tons of anthracite coal and nine hundred pounds of carbide for the English Company, and a lot of empty barrels for Severin Dahl in behalf of the A/S Spitsbergen to be delivered at the whaling-station at Green Harbor.

Burrall found on arrival at Advent Bay, after a rough voyage, that satisfactory work had been done during his twenty-four days' absence, in spite of cold, wet weather.

The towers for the tramway were up, the ropes were coupled and laid over the towers, ready to stretch, and it looked as if the cars might be running before the end of the season. But as the coal-pockets would not be completed up at the mine Burrall had little hope of using it for that season's coal, and proposed to send down rock for filling in at the dock, which he felt ought to be thoroughly protected now that the tramway terminal was installed on it, for its destruction or damage by the ice would involve serious loss.

Frozen Stock Piles. After carefully examining the winter stock-pile and that of the English Company he came to the conclusion that it was a doubtful policy to continue the practice of storing coal out of doors. In both, the snow which covered the surface melted when the warm weather came on in the spring. The water running down to the bottom of the pile froze again, forming a solid mass of ice and coal two or three feet thick. Burrall was apprehensive lest this freezing and melting process might injure the quality of the fuel, or, if not, lest getting it out might prove unduly expensive. After the frozen mass was uncovered it was left by the loading machines. The ice soon melted, and the coal was used under the boilers and at the camp. It was uninjured by freezing.

Excellent Quality of the Coal. The two hundred and ninety-two tons which the *Munroe* took back to Norway for the Nordenfjeldske Company was in fine condition, and the small coal left was sold to various whalers, and was used on the *Munroe* with astonishingly good results; for the vessel, though heavily loaded, was able to keep full speed, and took only five and three-quarters days from Advent Bay to Trondhjem, including stops at Green Harbor and Tromsø. The engineer reported that it caked enough on the grates to prevent its running through, had almost no clinkers, and made a hot fire.

The coal for the Nordenfjeldske Company was put into the bunkers of four of their "hardest firing" ships, and got a severe test, but it resulted so satisfactorily that Captain

Pallesen, the master of the steamship *Lofoten,* and Ole Olsen, the first engineer, signed a testimonial that the Arctic Coal Company's coal stood "on a parallel with the best of Newcastle coal as regarded heating value, and was considerably superior in durability and cleanliness."

The *Munroe* brought down also two tons of small coal, and gave it to one of the Trondhjem captains, who was so pleased with it that he telephoned to see if he could have some more. But the price of the small coal was only ten shillings a ton, and it was not intended to make a practice of screening the coal, so as a rule, there would be no more to sell. Burrall, in his letter of June 18, written just as he was returning to Spitsbergen, reported that he had definite information about the coal-sales of the English company: "They have agreed to deliver four thousand tons of 'the best sort Spitsbergen coal' at Narvik, f.o.b. railway trucks, for sixteen shillings nine pence per ton, and two thousand tons of the same at this port for sixteen shillings three pence a ton. They have sent up one chartered ship that is now loading, and have chartered another, of about eighteen hundred tons for four hundred pounds sterling a month, which is considered a low rate. Their agent tells me that they are sending up all the men they can get by this new boat."

Low Prices Justified. The Arctic Coal Company charged sixteen shillings a ton, delivered on lighters in Trondhjem harbor. The cost of putting it over the ship's side was from fifty-five to sixty ører a ton, so that the net price received by the company was fourteen kroner a ton. English coal had gone up a shilling a ton, but the Nordenfjelske Company refused to take that into account, and Burrall thought that the advantage of having their coal tried by an important industry justified accepting the lower price.

The Battle of the Barrels. A desire to be neighborly and accommodating had led to the offer of transporting at a nominal rate, some empty barrels from Trondhjem to Green Harbor for the whaling company. Then the whalers took advantage of the inexperience of a clerk of the Coal Company,

and, while Burrall was absent, secured a contract for taking a large number at the same rate. When Burrall returned to Trondhjem he repudiated the contract. This led to a law-suit which dragged through the Norwegian Courts for several years, and was finally decided in favor of the Arctic Coal Company on the ground that the Norwegian Law limited the authority of signing a ship's charter to the agent in charge or to the captain: the agreement therefore was not binding.

Operations at Green Harbor. Dahl, who was the owner of the whaling company, had control of a choice location for a coal-dock at Green Harbor, and had contracted with the American Company for five hundred tons of coal. He had the reputation of liking litigation; during the few years that he continued his whaling operations at Green Harbor, he proved to be an untractable neighbor, and kept interfering with the tentative operations which Ayer and Longyear instituted there, first in locating the beds of coal, and then in operating them sufficiently to obtain information for future use, should more extensive developments be desirable, and also to show good faith and the intention ultimately to work the property.

On the second up-trip this year two men had been left with tools and material to put the hut there in good order, and to get the snow out of the workings which were buried under heavy drifts. It was desirable to get out enough coal to supply the many whalers coming there during the summer, and for this purpose a number of men were set to work later under the charge of Mr. A. Mangham. Burrall wrote the company that the summer's output at Advent Bay would be about twenty-three hundred tons, including the local demand for fifteen hundred tons, and that he planned to get out and pile up ten thousand tons during the following winter.

Praise for Captain Naess. He gave warm commendation to Captain Naess, and thought that, as it might be advisable to let the *Munroe* go on charter voyages during the winter to trade with European ports, Captain Naess, who held first-class Norwegian Master's papers, had served an American

Company three years and the Coal Company a full year, should be furnished with American Master's papers also. The Trondhjem Customs authorities had made inquiries at the Department of Navigation, and given notice that the *Munroe*, with her provisional American charter, was free to engage in the Norwegian coast-trade. Only the Swedish vessels were barred from so doing.

Burrall also proposed to return to Boston as soon as the Spitsbergen season was ended, and the third and last voyage was completed. It seemed to him best not to attempt a fourth trip. He enclosed in a personal letter to Mr. Longyear, supplementing his reports to the Boston Office, several small kodak pictures of the works at Advent Bay. Though small they give an excellent notion of the condition of affairs and of the difficulties under which work proceeded.

The Camp Doctor and the Steward. The camp doctor at the last moment decided that he would not go, and though he furnished a certificate that it was because of ill health, Burrall was inclined to think that he was malingering. They let him off, however, and engaged a Norwegian physician from the Army, and had to pay him a large advance. He found that the men at the mine objected to the steward because he called them hoboes, made a brew for himself out of hops, and kept tipsy on it, and when the men complained he made it disagreeable for them. He was dismissed, although he saved money for the company and a new man was engaged.

The Spitsbergen Coal and Trading Company offered to sell a part or all of their equipment opposite Advent Bay, but when Burrall put in a bid it was refused.

4. CLAIM-JUMPERS

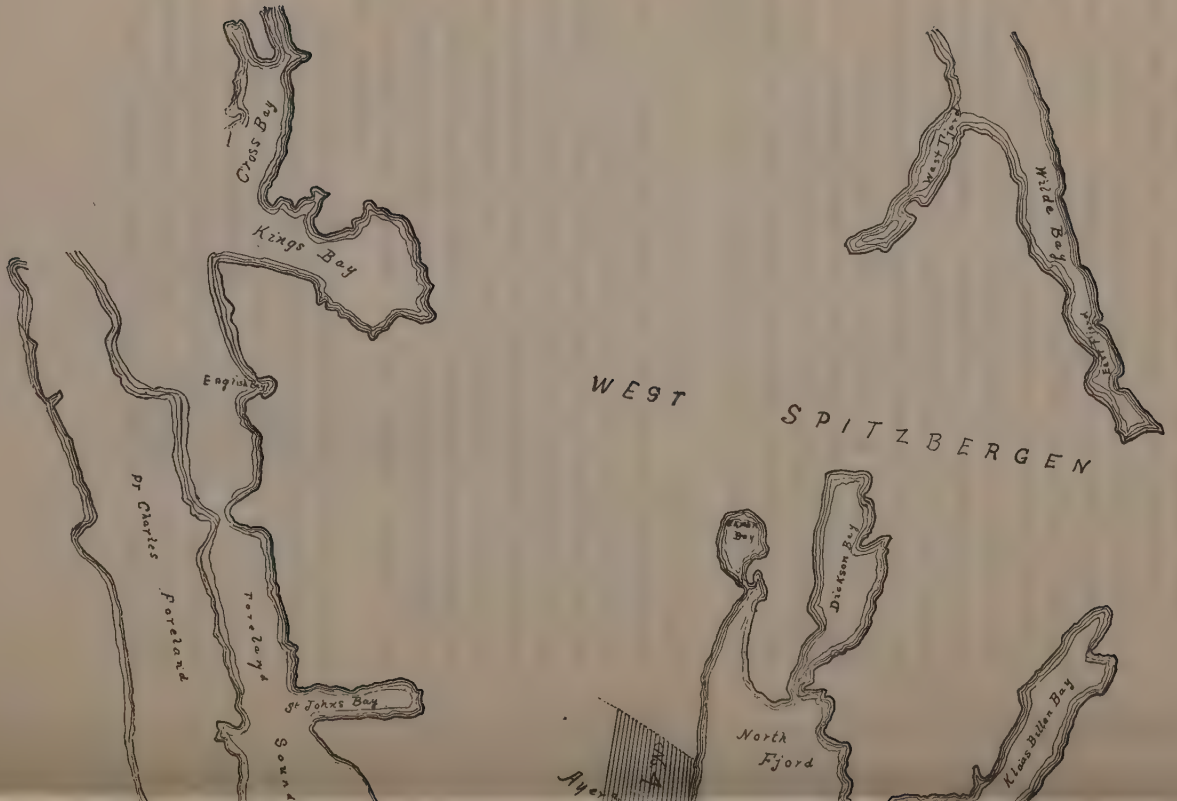
The business-like methods of the American Company, their lavish expenditures, and above all the excellent reputation of the coal mined at Advent Bay, began to make the Norwegians "sit up and look around." Could not they go and do likewise? Could they not at least form stock companies and sell shares at a good figure? And could they not quietly send

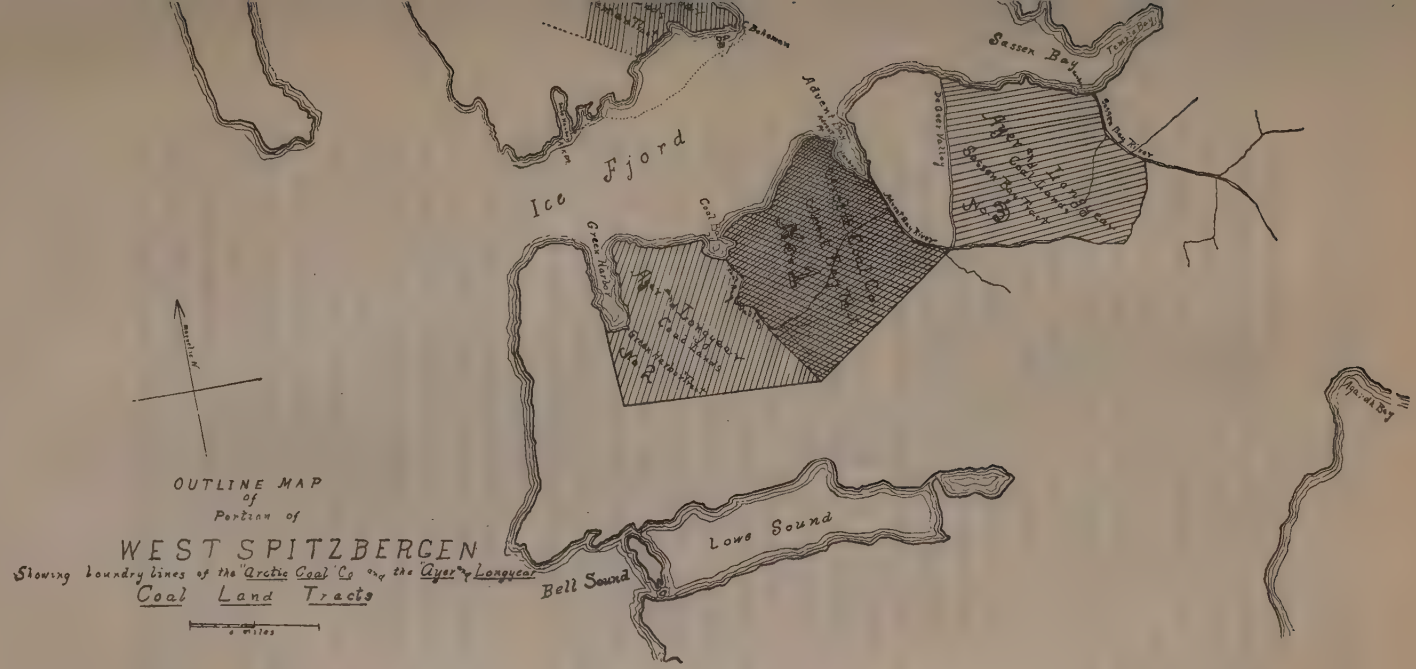
men up to Spitsbergen and stake out claims, even though these claims ran counter to those already preëmpted by the Arctic Coal Company or by Ayer and Longyear? And would it not be an easy way of getting a few thousand kroner to make the claims, and then sell out to the Americans?

Analysis of Green Harbor Coal. The coal-seam at Green Harbor where the small body of miners worked during the summer of 1908 had penetrated more than a hundred feet, was found to keep its average of forty-eight inches in thickness, and showed unusually clean coal. Various openings were also made at intervals for a distance of nearly a mile and a half. The local analysis made by Burrall showed that it had a little more moisture, volatile and sulphur, and fixed carbon, and a little less ash than the Advent Bay Coal, with a resultant diminution of from three hundred to nine hundred British thermal units. No attempt was made to continue the work beyond the summer months but it was planned to take it up again as early as possible the next summer.

The Whale Company's Trespass. There had been a verbal understanding with the Aktieselskab Spitsbergen of Tønsberg, the whaling-station of which called Finnæs, was situated just below the Ayer and Longyear claim, that the American Company were free to build a wharf and loading-station at any point along the shore where there would be no actual interference with their *trankogeri* or boiling-works, and the only sign or mark this Norwegian Company had put up was a long board marked "A/S Spitsbergen, Tønsberg." The boiling house displayed in large painted letters:—"Sev. Dahl, Tønsberg."

But when the whaling company learned of the discovery of a very desirable bed of coal there they suddenly decided that they possessed all the shore line, though they had no use for more than one hundred and fifty yards of it. In August, 1908, they erected three posts, and signs considerably farther up the hill, one of them being only twenty yards from the Ayer and Longyear camp and dated them May, 1905. More-


Cross Bay
Kings Bay
English
Pr Charles Foreland
Treslong
St Johns Bay
Sound
WEST SPITZBERGEN
Wilde Bay
Dickson Bay
North Fjord
Klaas Billen Bay


Ice Fjord
Sassen Bay
Bell Sound
Lowe Sound
Grey Harbor
Coal Bay
Advent Bay
Green Harbor
Sassen Bay Valley
Tempelfjord
Tempelfjord Bay
Bell Bay Coal Lands
Sassen Bay Coal Lands
Bell Bay Coal Lands
Green Harbor Coal Lands
Bell Bay Coal Lands
Sassen Bay Coal Lands
Green Harbor Coal Lands
Magnetic N
OUTLINE MAP
of
Portion of
WEST SPITZBERGEN
Showing boundry lines of the "Arctic Coal Co" and the "Ayer & Longyear"
Coal Land Tracts
5 miles

over an inscription in Norwegian stated that these marks were on the property of the Aktieselkab Spitsbergen, and that the brook belonged to them even to the top of the mountain, thus infringing on the Ayer and Longyear property, for nearly, if not quite, a mile. The extension of the new line of posts cut the mine opening off from direct communication with the coast, and the management intimated to Burrall that for the privilege of building a wharf at Green Harbor a considerable payment would be required.

A Fraudulent Claim. Enquiries made at the Foreign Office at Kristiania and elsewhere failed to elicit any record of such claims having been made or reported. But the manager of the Aktieselskab, Knut Raaum, of the firm of Severin Dahl, under date of December 24, 1908, wrote to the Royal Department for Foreign affairs, at Kristiania, bringing to the knowledge of "the honored Department" that they had in August, 1904, fenced in on the east side of Green Harbor, Spitsbergen, a projecting headland including about two hundred thousand square meters, with a shore line of about five hundred meters, for use in their whaling business, and that in June, 1905, they began the erection of the houses necessary for the business and finished them; that they had carried on that business every year since, starting from Tønsberg in the middle of May, and returning from Spitsbergen about the middle of September.

The whaling company had bad luck during the Summer of 1908, the empty barrels which had been carried to Green Harbor were still empty, and they were seriously thinking of abandoning the enterprise and of transferring it to the South Pacific. At all events they were evidently attempting to force Ayer and Longyear to buy them out, realizing that as they controlled available water-front at Green Harbor they held a trump card. Burrall wrote: "They will try to hold us up for all we will stand." About the same time J. Falk-Dessen, also of Tønsberg, happened to be at Green Harbor and, animated by an eager spirit of enterprise, set up two boards on stakes hammered into the ground to sig-

nify that he had "annexed a piece of land on the east side of the fjord north of 'Finnæs,' with shore rights from low water mark to five kilometers inland, and thence both south and north to the marks respectively there placed."

Lars Iversen's Impudent Offer. Still another interloper appeared in the person of Lars Iversen, of Solheim, Tjømø, who offered the American proprietors to sell for a reasonable price his "private property which lies between Arctic Coal Company's properties and those of the A/S Spitsbergen." He added:—"And it is this, my private property, which you really need. When that is in your possession, then you have ground enough both for harbor, dock-constructions, houses, and railroad to your coal-mines." His letter came to Carl S. Saether, the company's clerk at Trondhjem, who, knowing well that Lars Iversen's name was not on any landmark at Green Harbor, though it was possible that he might have bought a small strip of land of the Aktieselskab, replied, stating that the Arctic Coal Company cherished no gratitude to him for his being "willing to sell for 'a reasonable price,'" and questioned whether there were any reason for gratitude in a man's occupying land and "militating against real business, simply for purpose of obtaining this 'reasonable price.'"

Iversen replied stating that he had been the first person to discover the point in Green Harbor, and "let it be named Finnæs (Fine Point)." He said: "I occupied this whole point, the outer end for the A/S Spitsbergen for whaling, and the inner side of the point for myself, where I have built a house, and fish salmon. Those coal-veins, which lay straight up above the point, none knew about besides myself. I did not want them myself, or saw myself able to develop them. It was me, who worked with the leaders of the Arctic Coal Company to get them to start there, it was I, who had these people under my supervision and managed the work there." He was grieved that Saether charged him with "occupying land and militating against real business" and he ended his letter by assuring the Arctic Coal Company that they "both needed each other and could be for each other's help."

Saether then telegraphed that the Company demanded free access to the harbor, and offered him free use of the dock that would be eventually built. To this Iversen telegraphed back that in case he bought the whaling industry he should demand the right to buy coal as needed "after Scotch price."

An Unpleasing Proposition. This was a new term to Burrall and he had no intention of entering into any such coal contracts; neither did he like Iversen's proposition at all. Another letter came from Iversen in which he warned Saether that Severin Dahl of Tønsberg would probably refuse to acknowledge that Iversen had any property at all at Green Harbor. His claim, however, was based on the fact that the "A/S Spitsbergen's part owners" had no knowledge of how much land they owned on Green Harbor, and, as Iversen had never been requested to take more than was necessary for the whaling industry, he had felt justified in annexing the other part as private property.

Burrall, reviewing the correspondence, thought Iversen's position very weak, and his claim that he had taken two hundred meters of land inland besides the water front "for the purpose of catching salmon" very trifling. Nevertheless, in spite of the doubt whether a person in Iversen's former position could take land in his own name, he was inclined to pay the man twenty-five hundred kroner which was the amount he wanted, as representing the amount he had lost in the A/S Spitsbergen Whaling Company.

Severin Dahl had telephoned from Tønsberg to Saether in Trondhjem in January that his whaling company was about to dissolve, and asking if the Arctic Coal Company would like to bid on their property at Green Harbor. This message he followed up with a telegram as follows:—

"Telegraphic decision absolutely necessary if station Green Harbor any interest Arctic Coal, as it otherwise at once will be rented out other company for the present year's hunting season. Houses and all woodwork costs more than thirty-five thousand kroner, whereto come the steam machinery and the steam boilers, which you also desire. Telegraph best

offer these things, but blubber, kettles all kinds and station furnishings excepted. If business will be included [concluded], five per cent for you privately, as company prefer selling rather than rented out."

SAETHER'S OFFER. Saether, on authority previously granted, telegraphed an offer for ten thousand kroner "on the condition conveyance ground (land) Green Harbor without hindrance strangers." With cheerful honesty he wrote the Coal Company: "I need not add that the proffered five per cent graft, if collectable, will be placed to the credit of this company." He also noted that their law-suit against the Aktieselskab had not as yet been decided, and that their attorney had demanded the "contract of delivery for the coal," and he had sent him "the one Mr. Burrall had made out in Tromsø with Lars Iversen for five hundred tons."

Iversen's offer, however, was accepted by Saether, subject to approval by the Boston office, and accordingly the Arctic Coal Company "withdrew from the competition."

If Iversen bought the whaling company's rights and establishment, he would be likely to require considerable coal, and, though his title to the land in itself was of no consequence, it would be if he became the possessor of the A/S Spitsbergen's holdings; so the small sum he demanded would be of small consequence. As it eventuated however Iversen did not acquire the whaling business.

Saether, besides communicating these tentative dealings, informed the company that he had received an application from Herre T. C. Hartmann of Tromsø for coal for his steamship *Victoria*, the master of which was Captain Johannesen, Saether informed him that the Arctic Coal Company would be able to supply him coal at a cheaper rate than he could get it at Tromsø.

5. NEW CLAIMANTS AT GREEN HARBOR

During the summer season of 1907 Kandidat Adolf Hoel, who had served as a geologist on the steamship *Kvæfjord* with the Prince of Monaco's Scientific Expedition, had run

across outcrops of coal on the easterly side of Green Harbor Fjord, about three kilometers from the bottom of it and on a tract of land located and claimed by Ayer and Longyear in 1905. When Hoel returned to Norway he persuaded three Kristiania men to back him, one of them being Direktør F. Hjorth. The next summer, while at Green Harbor he staked out again the piece of land; he did no mining and filed no claim with the Foreign Office but asserted that he had two witnesses, and that he had buried near one of his stakes a tin box with a description in English of the district "annexed."

Description of the Hoel Claim. Hjorth's document contained a rather elaborate description of the territory:— "The slope of the mountain down toward Green Harbor" it says, "is very abrupt (*brat*); one can with difficulty crawl up it. Toward the sea the slope of the mountain is considerably less abrupt (*slakere*). The mountainsides are, as almost everywhere in Spitsbergen, covered by deep talus (*ur*), consisting of fine materials. It was at a place on the slope toward Green Harbor Valley that I first found the coal. The slope here was very steep, and the talus, in consequence thereof, less deep. Elsewhere one sees only shattered bits of coal in the talus. The mountain's height is about three hundred and twenty meters."

Profile of the Mountain. The description goes on to give in detail the profile of the mountain, showing that there was an alternation of sandstone, black slate weathered to a fine gravel, coal-seams, gray slate, and sandstone, gray-blue or greenish and bituminous. The lowest coal-seam lies at a height of two hundred meters above the sea. The observer claimed that it was four meters thick and unbroken by "bone." The second considerable coal-seam was two hundred and twenty meters above the sea.

Green Harbor was described as being excellent and well-protected against all winds with deep water except off the Valley. "The ice," said the report, "lies usually until the middle of May. It forms most often in October, but it is not so

thick but that an ice-breaker is usually a match for it. The coal-field belongs to the Tertiary foundation [formation], which occupies the whole peninsula between Icefjorden and Bell Sound, except the farthest (*yderste*) strip of coast."

The description of the coal found there was rather hazy because Hjorth's agent did not have an opportunity to make a close examination, the whole seam being covered by a deep snowdrift; and no samples could be obtained. He could not even give an analysis of the specimens brought away the year before. He had a vague remembrance that the ash amounted to twenty per-cent, whereas the ash from the Advent Valley Coal was (according to him) "only a couple (*et par*) per cent." One cannot help wondering how these Norwegians would have succeeded in coal-mining unaided by American money!

The American Mine. The notification gives an interesting account of the other mines on Spitsbergen: "The one mine belongs to the Trondhjem-American Coal Company, and lies on the west side of the bay near its head (*bund*). The mines lie at a height of two hundred and eleven meters above the bay. The coal seam is four feet thick. Thirty-three men wintered last winter. In summer they work there with one hundred men. From the mines to the sea they are engaged in constructing a cable-railway fifteen hundred meters long. The coal is carried right out onto a splendid wooden wharf which is in construction. The ships lie alongside the wharf. Here no coal has as yet been exported, but they sell to the whale fishers and to the tourist steamers. The price is fourteen crowns per ton. This coal-field belongs to the same level (*niveau*) as that found by me. An apparently perpendicular sandstone wall rises above the coal-seam.

The English Mine. "The other mine belongs to the Bergen-English Coal Company, and lies on the east side of Advent Bay, near its mouth. The coal-seam here lies lower, about one hundred meters above the sea. It is two meters thick. In the coal-seam two strata of sandstone were found, so that one has here five almost equally thick strata of coal and sandstone. Harbor conditions are poor here: the place

lies out toward Isfjorden, so that there is often surf (*dønming*). The ships must anker a good distance from the shore. The coal is carried out in lighters. Here also thirty to forty men have wintered. The Company has orders (*har en leverance*) from the State railways for about six thousand tons this Summer (*i-Sommer*)."

Hoel also mentioned several other "finds" claimed by the American Company at Green Harbor "in the mountain (*fjeldet*) right opposite the whale fisher station where four men this summer lie and mine coal"; at Coles Bay, in Sassendalen, near Faestningen, and on Cape Boheman, the latter with coal belonging to the Jura formation; but the most promising was thought to be the one in Green Harbor, which he claimed was eight or ten kilometers from the coal-fields found by him.

Brilliant Prospect. He ended by remarking that the geological formation of the peninsula between Bell Sound and Ice Fjord was very regular: "The strata lies [*sic*] nearly horizontal; the same succession of strata (*lagfølger*) is met with everywhere. A systematic geological investigation of this peninsula would doubtless show that mineral coal is found in a lot of places. It is therefore my opinion that an energetically conducted company here will be able to do a splendid business, especially now after the great improvement which mining in Western Norway has shown, it will be easy to find a market for the coal here. The journey from Isfjorden to Tromsø takes, in a ten-mile boat, two and a half days of twenty-four hours. Weather and ice-conditions between Spitsbergen and Norway are excellent in the summer time."

False Statements. Both Anker and Hjorth tried to prove to the Norwegian Government that the American proprietors had no shadow of a claim to the Green Harbor district. Hjorth wrote that the Ayer and Longyear house stood about eight kilometers north of the northernmost point of his coal beds, "separated by a broad, flat valley, Green Harbor Rendal, which at the bottom is about one kilometer wide,

and that the inscription* on this house showed plainly that the Americans owned nothing to the south, since it expressly read: "stretches from here to Coal Bay," and Coal Bay is situated directly to the east of their house. He therefore urged that the statement that Ayer and Longyear had previously taken possession of anything south of the valley in 1905 is "without all foundation."

The Anker Company, in filing their claims asserted not only that the Americans had no rights there, but also that Hjorth's possessions were mythical. In regard to the latter the agent Claus Winter-Hjelm wrote:—

"Neither Mr. Ytteborg nor Mr. Sessen, his witness, has seen any (land-) mark up there, which can give evidence of Hjorth's occupation. According to general theory (*efter almindelig lære*) right of possession (*eiendomsrat*) to unowned (*herreløst*) goods (*gods*) or land is acquired (*stiftes*) by occupation, but this occupation should (*ör*) take place in such a way that it can be recognized by a third party (*tredjemand*). Now Hjorth, according to his own explanation, has only hammered stakes into the ground and had these covered again *just so* that a third party cannot see them, and thereby is made unable to recognize the occupants taking possession. This naturally is still more true of the tin boxes buried in the ground spoken of by Hjorth."

As to the Americans, his attorney wrote: "It has further come to my ears that the American Company, Ayer and Longyear, who are working in Coal Bay, have (*skal hav*) occupied the land south of Green Harbor's top (*bund*), and from this

*The inscription on the Ayer and Longyear house, of which the trespassers tried to make so much, was painted on the side of the house, in Norwegian, probably by some Norwegian workmen or possibly by Anker's men. It did say, "From here to Coles Bay" etc., but no one had been authorized to put it there and no one ever seemed to know who did it. All inscriptions made by the Arctic Coal Company and by Ayer and Longyear were in English and never in Norwegian. The trespassers insisted on ignoring the maps and claim-stakes which were repeatedly shown to all of them, and referred to the Norwegian inscription as if it were the only one on the property. J. M. L.

along the east side of the fjord to the whale fisher station. But here the same applies as in the case of Hjorth's occupation above: no sign (*tegn*) or marks are found that indicate that the occupation has taken place. On the contrary on the wall of Ayer and Longyear's wintering house back of the whale fishing station, north of it, it is proclaimed that the firm's occupation reaches from here to Coal Bay. If the American-Trondhjem company several (*flere*) years ago occupied the land around the top of the fjord, it has not at all events continued its taking possession (*besiddelsestagen*); for absolutely nothing has been undertaken in there; their mining they carry on far from there: up in Coal Bay.

"Should the American-Trondhjem company claim (*hævde*) for itself right of possession in there, I must likewise protest against the validity of this claim; when Ytteborg this summer set up his cairns, there were no other such to be seen or in general any marks whatever to indicate that this land had been occupied before."

This statement was wholly false. Mr. Longyear says: "There was a conspicuous Ayer & Longyear claim-stake on the shore near the west side of the glacier at the head of Green Harbor. Pencil inscriptions written on this stake indicated that it had often been visited by Norwegians."

How little it was the intention of these interlopers to utilize the coal fields at Green Harbor may be gathered from a letter from I. Falk Dessen to Anker's attorney in November, 1908. After declaring that he had "never seen anything resembling cairns or iron stakes" such as were said to have been set up in the interests of Hjorth, and expressing his doubts regarding the position of the territory claimed by Hjorth, he said: "I have not yet definitely given to anyone the refusal of (*haand givet*) my field, and am still ready to negotiate concerning it. It is situated considerably farther out in the fjord, and is therefore accessible (experimentally) one month earlier on account of the ice than tracts lying within the whale fisher station."

The same month Hjorth warned Engineer Erling Einar

Angell Thiis, who according to the Norwegian newspapers had taken possession of a large tract of land around Green Harbor in Spitsbergen, where coal was found, to beware of encroaching on the territory which Hoel had marked with iron stakes and cairns.

Anker's Unscientific Mining. Anker had caused to be built a small hut not far from the camp of Ayer and Longyear, and had dug a series of small pits a few yards from theirs. This was regarded as a very childish performance, for an examination of the pits dug by the American Company would have shown anyone who had the slightest knowledge of coal-mining that the coal exposed there was not worth the trouble and expense of making further experiments. The Anker camp had never been occupied; his men, who had stayed only a few days, left in the same small vessel in which they came! Hjorth had brought over material from the abandoned English camp, and had erected a house not far away and maintained two or three men in it continuously. In 1908 they dug a pit in the coal-seam to a depth of about fifty feet, but, as they did not secure the entrance, the water from the snow melting in the spring had filled it up and frozen solid. Then, instead of securing the entrance and excavating the ice, they started another pit just like it a few meters distant.

6. THE ANDREAS SCHRODER CLAIM

Still another claimant appeared in the person of a man named Andreas Schröder, who had succeeded to the claims of a Norwegian named Neilsen. Neilsen had staked out a small claim on the east side of Green Harbor near the entrance, and built a hut, near which, in 1903 or 1904, he did a small amount of work in a vein of rather poor coal, dipping quite steeply toward the north, and certain to result in wet mining when it reached sea level, which would be at a depth of not more than one hundred feet. This Schröder, through Emil Melle, a lawyer of Tromsø, informed the Norwegian Govern-

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ment that he, with several others, had in the year 1900 formed a company under the name of Kulkompagniet Isefjord "for the purpose of taking possession of and exploiting coal fields in Isefjorden in Spitsbergen." He told how in the summer of that year an expedition was made to that district with twelve men, who annexed and enclosed with steel wire on iron stakes "parts of Cape Boheman, Advent Bay, and of the east and west sides of Green Harbor." He claimed that houses were built and coal was mined, to such an extent that 1,000 hektoliters were taken home to Norway, involving an expense of "something like thirteen thousand kroner."

He claimed that the wealthier (*mere kapitalstærke*) members of the company refused to contribute further to the "proper exploitation" of these mines, or take part in the yearly expeditions required for keeping possession of the fields occupied, and that in 1902 Herre Anton Tschudi, the company's disponent or manager, announced that it was disbanded, and that each partner might take his own. He continued: "Andreas Schröder thereafter, and in fact ever since 1901, alone and at his own expense, maintained possession of a part of the company's earlier possessions, namely Green Harbor's east side. He has thus by frequent visits—he has been to Spitsbergen every year—looked after the fence and house in Green Harbor. Some years he has been there several times, and in part remained there a long time, while on the other hand one single year—1907—it happened that he, when he was at Isfjorden, by reason of the ice-conditions, could not come into Green Harbor. Several years also wintering expeditions have had permission to occupy his house on condition of looking after the property, and taking out a small quantity of coal. Coal was also mined and brought home by Schröder himself, both in 1906 and 1909." He declared that he had erected three houses on the property and was maintaining four men there to protect the property, the exact boundaries of which were marked with posts each bearing a zinc plate with the conventional information regarding its ownership.

In spite of this he complained that through the incentive furnished by his example, and the coal brought down to Norway, "other companies with the same aim had been formed," and that these had taken possession of his company's earlier possessions. He said: "If Schröder had not been so watchful they would have certainly have taken them all, which is most evident from the fact that repeatedly, in spite of Schröder's continuous assertion of his claim in Green Harbor, it was attempted to take from him his property there. Schröder has, on behalf of the members of the company, sought to protect the land once taken up, and he has repeatedly written and telegraphed to the company's manager and other members advising them that there was danger of losing the land if nothing was done. But Schröder never received any answer that could lead to any action on the part of the company or on its or any of its members' behalf, since Schröder is dependent upon the result of his catch, and therefore cannot very well act on behalf of others year after year at his own expense, and to the detriment of his own industry.

"The result has been that the whole property (*landnam*) has, as abandoned, been taken up by others, chiefly by foreigners. In order meanwhile to rescue a part of his earlier work and of his private interests, and in order that foreigners should not get hold of it altogether, Schröder has at his own cost sought to the best of his ability to maintain possession of east side of Green Harbor. This has been been done in the manner already described. In the meantime a company with American capital, and mainly American administration (Longyear and Ayer, Margarithe, Micican), has also tried to get hold of the land there—certainly the best coal-fields in Spitsbergen. They have thus in 1908 and 1909, in spite of the fact that Schröder was at the same time on the spot and protested, built two houses within Schröder's enclosure in Green Harbor, right by the harbor, and by breaking through the fence opened access to the coal-seam which lies here just above the fence that runs along the fjord, but which, however, lies within the territory taken up—the cross-fence goes up

the mountain (*tilfjelds*) and in any case within the land taken up in 1904."

It is seen by his lawyer's confused and ridiculous letter that Schröder undertook to extend his claim to cover a good part of the Green Harbor property of Ayer and Longyear. They had no objection to his owning and operating the Neilsen claim—its value was quite problematical—but they were ready to contest more sweeping contensions; moreover they welcomed the idea of confining all such rivalries to the Green Harbor tracts, which they themselves proposed to work, not so much for the immediate value of the coal there, as for the purpose of confirming their rights to the property.

These various conflicting piracies furnish some of the comedy of coal-mining in a land where there was no law: but their clashes and annexations, their claims and counter-claims, led, as we shall see, to an attempt to settle the status of Spitsbergen by a convention in which all the Northern Powers—Norway, Sweden, Russia, England, and of course, the United States, should come to some agreement on a practicable scheme for governing the Archipelago, repressing disorders, deciding suits, and protecting the wild life which tourists and hunters were rapidly exterminating.

Whenever the representatives of these interlopers appeared at Green Harbor they were met by the foreman of Ayer and Longyear's camp, who was instructed to explain to them regarding the rightful ownership of the land, and to show them blueprints, maps, and the like. It had been decided not to use force in expelling them, as was justifiable, but rather to await the action of the United States in its negotiations with Norway and merely make repeated protests to the trespassers, warning them that they were responsible for any consequences resulting from their action in persisting in the trespass.

Reitan's Narration. In this connection it will be interesting to read the narration of Hjorth's agent, the Engineer Frederick Reitan, which was included in Hjorth's "documentary evidence." After describing his difficulties in reaching Green Harbor, on account of the ice which had held on until

into July, 1909, and reiterating Hjorth's assertion that the American Company had not marked their properties with properly dated stakes, he continues:

"The fjord was now in such condition that one could row almost every day (over) it; but as we had not yet had time to concern ourselves with the moving, two other men had to row over to the west side every evening, and brought back each morning some goods, until we had enclosed a part of the field. Friday, July 9, we received a visit from the American Director, Mr. Burrall. He was very abrupt (*skarpt*) in his manner, and forbade us to do anything there, as that was Ayer and Longyear's property. I stated to him that I could not take any orders from him, that the things that were there would remain there, and that I would bring there still more, that I intended to carry out the work which I had come there to carry out.

"I then challenged him to prove his claim (*ret*) and show his land-marks, whereto he replied that the land (district, *omraade*) had already in 1905 been taken, of which he in the month of May this year had personally advised Director Hjorth. I could only reply thereto: As I found no (land-) marks in the field, I would stand on my right, and forbade him to touch anything of ours; likewise I forbade him to come there with any orders, as no notice would be taken of them. Thereupon he went about and tore down our (land-) marks. Upon his return I explained to both him and Daae the wrong in such a manner of procedure (*fremgangsmaade*), and said that I must conclude from it that he felt uncertain. If he had been entirely certain of his right of possession, our (land) marks and boards would not have played any rôle if they had remained standing; he was also informed that in spite of this the original (land) marks, which Mr. Hoel had set up in the land (*marken*) in 1906, were there still.

"As, on account of the low water, he could not leave at once, I had an opportunity to sift further with him the question of possession. It was explained to him how one might (*maate*) conjecture (*anta*) that so large a land in one year could be occupied, that it must (*maate*) have been annexed

on the map and not on the ground (*i marken*), as it was an impossibility to travel over so large a district as they now called their (*sin*) property, and I did not believe that any land's law would acknowledge the correctness of such a manner of procedure. To this he answered nothing but stated that he, as his firm's representative, *had* to stick to what I had said, and that law must decide in this matter.

"Upon departing he charged me to find much coal, and if we intended to drive in a shaft (*drive ind Stoll*) to shore it up (*forstötte den*) with materials out of the opening, as it otherwise would fall in (*rase sammen*) in winter."*

Then, after reiterating their statement that the notification attached to the Ayer and Longyear hut made no assertion of property south of it, a pretentious outline was given of the preparations made for actual mining on the coal-seam which they had uncovered and investigated in the field for a distance of five or six kilometers reckoned from the southwest corner of their claim. Hjorth also demanded that the Norwegian Department of Foreign Affairs should secure copies of the maps and other documents which Ayer and Longyear had deposited with the State Department at Washington, as supporting the claim of the Americans to the lands annexed by him.

Unjustifiable Suspicions. Although it may be anticipating a little, a later letter from Hjorth communicated to the Norwegian Department of Foreign Affairs his suspicions that Ayer and Longyear's agents "were not in Green Harbor in 1905 as they assert" and the Americans had "simply (*uden videre*) taken possession of districts to which Schröder and the proprietors of the whale fisher station had prescriptive rights . . . . as if the owners had never existed." His letter ended: "I must, therefore, protest against the legality of Messrs. Ayer and Longyear's right to the east side of Green Harbor, where with the others, my district lies, duly

*Burrall's idea in giving these instructions to Hjorth's men was that—if they did any work on the Ayer and Longyear property, it should be properly secured and ultimately allow the rightful owners to get the benefit of the trespass.—J. M. L.

(*behørig*) marked and enclosed, with house built, and which even in winter is watched and worked."

7. CHRISTIAN ANKER'S CLAIM

Anker's claim, as represented by Edmund Ytteborg and engineered by the enterprising Erling Einar Angell Thiis, also was bolstered up by an interesting diary of a visit made to Green Harbor in the early part of 1909. This document, written in elegant Norwegian-English, was signed before a notary by Fredrick Sebastian Nannestad, bearing the title of Bergkandidat, or Candidate in Mining, who visited the region in a ship commanded by Jacob Falk-Dessen. He says:

"The undersigned Fredrik Nannestad, candidate in mining, twenty-nine years old. domiciled in Christiania, had charge of the expedition sent out to Spitsbergen in the summer of 1909 by Chr. Anker, merchant in Fredrikshald. June 10 we left Christiania on board of the steamer *Eviva,* owner William Hansen, Bergen, rented for this purpose; further, accompanied two machinists, four sailors, one of which, Mr. Ludvig Roed, took part in the work on shore, a steward, a cook's boy, and two mates. Further, there accompanied the people engaged by Anker, engineer-corporal Leif Hafstad, Trondhjem, and the miners Marint Ragnlid, Tromsö, together with ice-pilot (*Islods*) Stenersen, Tromsö. Finally as passengers: Mr. Edmund Ytteborg, Christiania, and Captain J. Falk-Dessen, Tönsberg.

"The ship went straight to Green Harbor via Bergen and Tromsö. We went ashore first on Green Harbor's west side, a bit inside of 'Faestningen.' At the landing place we set up an occupation mark, in form of a sign (*tavle*) made of wood (*bord*), about a square ell large, nailed fast to a ca. two meters four inch box, which was buried about one and a half feet in the ground, and piled up (*stemplet op*) with stones. The sign was further secured (*stottet op*) by stays of iron wire. The following text was carved in the sign (*tavle*) with a knife: "Green Harbor Coal Co., Ch. Anker." The 22nd of June, 1909. From the fortification [the island Fæstningen] ten kilometers

inland from low water mark on the shore to Green Harbor Glacier, where marked out in 1908.' The last sentence (*periode*) was signed in the same manner by F. Nannestad, J. Falk-Dessen, and Edmund Ytteborg.

"The same day, as the ice conditions were unfavorable in Green Harbor, *Eviva* went to King's Bay. We went ashore on the Fjord's Southwest side a little inside of the whaler's (*fangstmændenedence*) hut. One of the whalers, Olaf Ericsen, Tromsö, went with us. We tried to force our way into 'Kulhavnen,' but failed in this on account of snow and ice-obstacles (*isforhindringer*). Where our efforts ended we set up a sign (*mærke*) of the same sort as that above described with text thus: 'Annexation of coal harbor Green Harbor Coal Company Chr. Anker. In witness hereof Dessen and Nannestad (possibly Hafstad) 23/6, 1909.' Before our departure on June 24 and 25 two further signs were set up in King's Bay, one on the southwest and one on the northwest side (the last near Blömstrand's Harbor, with statement (*paategning*) that there had been annexed for the Green Harbor's Coal Co., a tract five kilometers broad with shore right (*strandret*) from the low water mark inland around the whole of King's Bay between both signs (*mærker*). The whalers that we met in King's Bay under Olaf Ericsen's charge can all witness that from September, 1908, until we came, no expedition has been landed there and in general no one has been there in that time.

Marks at Green Harbor. "Thereupon we returned to Green Harbor, where we worked our way in to the whaler's station. During this work some marks (*mærker*) were set up on the fjord's West side, a new mark was set up near an old whaler's hut right by a German surveyor's mark; one of Ytteborg's marks here was torn down, another of his marks from 1908 was found a little further to the North uninjured. The inscription on the latter was renewed with a carpenter's pencil. On our new mark by the German surveyor's mark it was stated (*anförtes*) that the land ten kilometers wide from 'Faestningen' around Green Harbor's top

(*bund*) up to the whaler's station was annexed for Green Harbor's Coal Co. The date is marked June 29, 1909, and signed in witness by Hafstad, Nannestad, and Edmund Ytteborg.

Daae's Protest. "Over the ice we came on July 2, in near to the whaler's station, where we set up a mark on the land claimed (*angivelig*) occupied by Captain Dessen in 1908. Here the Americans' engineer, Daae, made (*nodlagde*) protest against the placing of the mark, maintaining that the field belonged to Ayer and Longyear, who, he claimed (*angivelig*), already, in 1905, had occupied this tract. Likewise Mr. Schröder, who has a house on the extreme edge (*udkanten*) of the fjord's East side, toward Dessen's claim (*okkupation*).

Conflicting Inscriptions. "July 3 we ankered by the whaler station, went ashore, where we found Ytteborg's main mark from 1908 partly torn down, and set a new main mark right by. This was placed on the South side of a little brook, only some few meters from Ytteborg's old main mark, and received the following text: 'Green Harbor Coal Co., Chr. Anker, July 3, 1909, in witness: F. Nannestad, J. Falk-Dessen, and Edm. Ytteborg. Ten kilometers inland from low water mark with shore right around Green Harbor's top (*bund*) to 'Faestningen,' toward the north to the mark set up by Ayer and Longyear in 1905, which bears this (*saadan*) inscription: From here to Coal Bay. On Ayer and Longyear's house which lies right by the firm's mark right opposite the whaler's station is written: 'Ayer and Longyear's property stretches from here to Coal Bay 1905.' On the whaler's station's South side near the fjord there stood a mark with inscription: 'Ayer and Longyear, Boston, U. S. A., 1905.' Opposite this mark the Americans have this year, presumably in May or June, set up a new one with inscription: 'Ayer and Longyear's, Boston, U. S. A.' with arrow → pointing in the direction of the fjord, N. S. Mr. Burrel, who is in Ayer and Longyear's service, finally admitted to me (*ligeoverfor*) that the said mark with the arrow was first set up this year.

"Besides the main mark there were further set up on the

East side in toward Rendal two marks, see Hafstad's sketch (*kroki*) of Green Harbor. Further a mark was fixed a little inside of Teistefjeldet' (on the outside) and across (*tværsover*) the fjord on the West side, just north of Green Harbor Glacier. On Teistefjeldet, Engineer-Director F. Hjorth's people were at work (*arbeidet*).

"The coal-seam was laid bare in three places on the east side (see Hafstad's map) at intervals respectively of six hundred meters and eleven hundred meters. The house was erected right by the mark first set up on the East side (Main mark) on Ytteborg's field. We worked about fourteen days with the inscriptions. The house is full of tools, and outside on the back side of the house there is piled up a lot of wood materials. The house is marked: 'Green Harbor Coal Co., Chr. Anker.'

"We left Green Harbor July 22 at four o'clock P. M. In the meantime we were again up in King's Bay, and took samples of coal there. On this expedition we found an old mark, dated 1901, set up by the Bergen Coal Company, but without any record (*paategning*) of renewal. Before our departure from Green Harbor we met the sloop that brought the house which was to be set up for the Green Harbor Coal Company in King's Bay."

Nannestad added to this declaration the following paragraphs:

"That in his conference with Mr. Burrel he asked the latter upon what authority his company assert their right of possession to the tract of country and the coal-fields that Ytteborg had occupied in the summer of 1908. In answer to this, Burrel referred to his marks, namely the original one—from 1905 down on the shore a little to the south of the whaling station, in connection with this to the inscription upon the house, and finally to the mark that was set up above the first mentioned 'landing-place.'

"To this the appearer remarked that any one can see that the last mark had been set up this year.

"Burrel owned at last that the last mentioned mark had

been set up this year, and ended the discussion on his part with: 'Well, I have done my business.' "

All these reports and diaries ignore the claim-stakes erected by Munroe at the southwest corner of Green Harbor in 1905. The trespassers were all told of these stakes, and the territory of Ayer and Longyear was shown on blue-print maps which were also shown to each trespasser as soon as he appeared on the property.

8. GUNNAR HOLMSEN'S CLAIM

As Ayer and Longyear claimed the property on the eastern side of Green Harbor by a right considerably antedating any of these "annexations," they were not greatly disturbed by the machinations of such schemers, which were often more amusing than vexatious. One of them, indeed, who came a little later, in the summer of 1909, recognized that "the question of ownership had not been as yet cleared up." This was Gunnar Holmsen, who gave notice that he had "annexed two tracts of land between Isefjord and Belsound (Belsund) where he had found some new coal deposits." He went on: "The first borders in the south on Hjorth's annexation of Green Harbor valley's South side, where a cairn by Skar Valley's (*Skardalen*) opening (*utlop*) into Green Harbor Valley gives the district's Southeastern point. Thence the boundary goes in a northerly direction through a little valley over to Ruselv's basin (*dalföre*). The boundary line is marked G. H. In the west the boundary line is indicated by several small cross-valleys (*tværdaler*). This field it is expected to work down Green Harbor Valley to a convenient harbor by the whale-station. Here, meanwhile, the question of ownership is not yet cleared up, so that it has been found wisest not to drive down marks, but claim is still laid to so much land as is considered necessary for execution of the work. The other district lies about twelve kilometers southeast of Coal Bay (Cole bay), on both sides of the valley which is called Slate Valley (*Skiferdalen*). Both in Nefjeld and in Colebayaksla there is coal-deposits (*kullag*)—in the last-mentioned field several

strata at a height of between six hundred and seven hundred meters (?) above the sea. From an iron pin in Colebayaksla's Southwest slope the boundary line stretches to a little valley that goes down into Coal Bay Valley (*Colebaysdalen*), and follows thus the latter's (*dennes*) south main stream (*hovedelv*) around Nefjeld and turns back along the stream in Skiferdalen to the starting point. This must presumably be worked to Coal Bay (Cole bay), where claim is laid to as much room as may seem necessary."

In another letter Holmsen informed the Foreign Department at Kristiania that the first tract which he had reserved for himself was "associated with" a mountain which he called Fossil Mountain, about ten kilometers from the whaling-station in Green Harbor. "Here," he said, "at a height of six hundred meters there is a stratum of coal which can be traced over a very large horizon. Above this again are several strata of coal up to seven hundred meters above the sea. Geologically considered, these coal fields can not be said to be connected with the coal-beds known in Green Harbor."

How Holmsen expected to work profitably mines at such a height, which would have to be reached by an enormously costly aërial tram, so as to deliver the coal to ships stationed perhaps three kilometers from the shore, is one of the questions belonging to the secret arcana of mining. But nearly all these so-called claimants showed a colossal and ridiculous ignorance, not only of the science of mining, but also of ordinary business ethics.

9. PLANS FOR DEVELOPMENT

Burrall returned to the United States in the late autumn of 1908, and while he was in Boston he submitted a series of estimates which he had worked out for the most advantageous development of the Advent Valley mine. If all the development work during the first year were to be done by hand-labor there would be ready for machine-mining six blocks of about three hundred feet each on each side of the mine entrance, but

the machinery would still have to be installed, which it would take until the end of the summer of 1911 to complete, and any considerable production would be delayed another year. The cost of this plan was estimated to be one hundred and seventy-five thousand dollars, and it would be in a condition to put out from four hundred to five hundred tons a day, beginning June, 1912.

Working the Mine by Hand. A second plan suggested working by hand until June, 1910, and then installing the machinery, the equipment being sufficient to put out from two hundred to two hundred and fifty tons a day. The next year, by means of an expenditure of forty-four thousand dollars, reduced to twenty-six thousand, eight hundred by the sale of coal, making a total cost of one hundred and nine thousand, eight hundred for the two years, the mine would be ready to produce from sixty thousand to seventy-five thousands tons a year, and this could be doubled by increasing the expenditure to one hundred and seventy-five thousand dollars, less the returns from the current sales of coal at a small profit.

An Alternate Project. The third plan was to put in the smaller equipment at once, having it in readiness for use by October, 1909, by which time the main-entry, it was calculated, would be excavated to a distance of about fifteen hundred feet, with the east and west secondary entries a little less than four hundred and fifty feet. Thus from the work accomplished during the winter the mine would be in readiness to produce as much as by the second plan at the end of two years, and the double amount would begin to be turned out by the beginning of the summer season of 1911. The cost of this plan up to June of that year was calculated roughly to be a little more than one hundred and fifty thousand dollars, minus the small profit of incidental coal-sales during the summers. But with the increased production under machinery the profit would be increased by at least fifty per cent.

The Second Plan Adopted. All these estimates, Burrall said, were dependent on the success in their attempts to get labor and transportation on satisfactory contract-terms. He

was inclined to favor this third plan which would make the mine ready for its maximum production in 1911 at a cost of one hundred and fifty thousand dollars, while the other two plans postponed till 1912 that maximum at a cost of one hundred and seventy-five thousand dollars. But it meant a preliminary expenditure of one hundred thousand dollars before a satisfactory knowledge of the condition of the coal seam would be obtained, and it was probable that the transportation of so much coal would be exceedingly difficult to consummate. On the other hand, plan number two offered the advantage of a moderate expenditure for the first year while the development was being pushed, and as the first considerable shipments would be only from two hundred to two hundred and fifty tons a day, transportation arrangements could be worked up gradually with more success. Mr. Longyear gave his approval to the second plan; but in the meantime Mr. Walter L. Coulson, an expert, was engaged to go to Spitsbergen and make a thorough examination of the whole property.

Estimated Costs. Gibson also submitted his estimates on the expected cost of machinery, buildings, repairs, and labor. He reckoned that the total expense of putting the property into shape to mine the coal by machinery would be about one hundred and twelve thousand dollars, to which would be added sixteen thousand dollars for labor. He recommended the English type of coal-cutting machinery, although the American type was far superior, but it would require the services of a demonstrator during an entire winter; and the distance from supplies, in case any breakage occurred, was too great. He proposed to build their cars at Trondhjem. He reported the giving way of the foundation of the storage-bin, which would have to be replaced, and a large part of the superstructure would need to be rebuilt. He approved of an all-steel equipment for the traveler and clamshell-bucket, which would be able to load nine hundred tons in a ten-hour shift. He made many other recommendations and estimates, including the expenditure of twenty-five hundred dollars a year on

the Green Harbor property, and reinforced his arguments with many well considered explanations and figures.

10. A TRUMPED-UP LAW-SUIT

Burrall sailed for his second season in Norway and Spitsbergen early in February, 1909. He stopped in England to attend to various matters of business at Sheffield and other places, and wrote that the Norwegian State Railways had bought thirty thousand tons of Hetton coal (English) at a price indicating a drop of more than two shillings a ton, and there seemed to be no likelihood of any immediate change for the better. The diminution in price would naturally considerably affect their sales of Spitsbergen coal.

He reached Trondhjem on March 19 and found everything in a satisfactory condition except for a suit which had been brought in the local courts against Captain Naess for having "stolen building material" from the old Cape Thordsen camp in 1905. The truth was that in the summer of that year the Arctic Coal Company had become hard pressed for certain materials for their work at Advent Bay and some men were sent on the Steamship *Ituna,* of Trondhjem, chartered by the Company, to the Nordenskjöld camp at Cape Thordsen, to bring back the remains of an old house and a few pieces of strap-rail iron. The house consisted of three loose walls, and was without doors, windows, roof, or floor. The camp at Cape Thorsden had been built more than thirty years before, and occupied for only two summers by a Swedish company engaged in working on a small fish and guano deposit there. During the winter of 1872-73 it had been occupied by a winter-bound party of seventeen whalers, all of whom died of scurvy. Ten years later it was used for one season by a Swedish Scientific Expedition; then it was again deserted, and at various times whalers and hunters had carried away the doors, windows, stoves, and much other material.

On February 13, 1909, Henrik B. Naess, Captain of the *William D. Munroe,* a ship flying the American flag, was summoned to appear before the Trondhjem Forhør "to answer

the charge of stealing" the iron and other relics from the Cape Thordsen camp four years before. It transpired during the trial that a Norwegian hunter named Furfjord, the one who had been arrested by the English company in 1906 for burglarizing the Arctic Coal Company's warehouse in the hotel building at Advent Point, which had been left in the care of the English company, had charged that Naess, or the company in whose employ he was engaged, had taken from the camp two or three houses, several thousand kilograms of iron, furniture, glass, a blacksmithing outfit, anvil, dynamite, and much other material valued at a total of two thousand kroner. Captain Naess claimed that the total value of the three house-walls and the iron was not worth more than fifty kroner, and he brought as his witnesses Captain Foss of the *Ituna,* Captain Jacobsen, the first mate, second mate Pedersen, and engineer Rønning, who all testified that Captain Naess's statements were correct, and expressed their opinion that the "scrap" taken away had no pecuniary value whatever. Captain Naess also claimed that he was there only as an interpreter for Munroe, who accompanied the expedition, and who assured him that he had permission to take the material, though he did not state from whom or where he had obtained it.

Burrall's Explanation. Burrall brought the matter to the attention of the Hon. Herbert H. D. Peirce, the United States Minister to Norway, and in his communication wrote this explanation:

"Before 1905, when the Arctic Coal Company took over the operations at Advent Bay, Captain Naess had been in charge of the work there for the old Norwegian Company which the Arctic Coal Company bought out, and so was supposed to act, at times, as adviser to Mr. Munroe. It appears that an attempt is being made to prove or show that Captain Naess told Mr. Munroe that he (Naess) had permission to take materials from Cape Thordsen, and so influenced Mr. Munroe to go there for that purpose. I understand that Mr. Munroe told his wife and another person that Captain Naess had the permission, but did not go into details.

"Captain Naess claims that his permission came from Mr. Munroe. So the case seems to hinge upon the question of permission. If it is proven that Captain Naess, in his zeal to promote work without delay, told Mr. Munroe he had permission to take material from Cape Thordsen Camp, and so induced Mr. Munroe to go there, the local court will probably judge him guilty of theft, unless they take into consideration that the property has been abandoned by the owners for some thirty or more years. As you are aware, Mr. Munroe was drowned in 1907. And as there was apparently no witness to the conversation between him and Naess on this matter of permission, it seems likely that the case will be dropped."

The principal reason for solicitude was lest the trips of the Company's vessel might be delayed by some injunction; and Burrall assured Minister Peirce that they were ready to assume any responsibility that was rightfully theirs, and pay such damage as they might have incurred. At the same time, the heirs of Nordenskjöld and Dickson, the only persons really interested in Cape Thordsen, had been reported as not caring to have the case prosecuted.

Minister Peirce telephoned to Burrall that he believed there would be no further annoyance because of the suit pending against Captain Naess, and the Norwegian Foreign Minister suggested, as a kind of sop to Cerberus, that the American Company might show its good will in the matter and hush up all adverse criticism by building a refuge-station at Spitsbergen for the use of needy sailors and hunters. Burrall replied that unless such a station were built at the upper ends of the Ice Fjord, in Elkman Bay, for instance, places which were seldom visited, it could not be located eighteen kilometers from existing houses where there were stoves and usually fuel. He therefore thought the project quite unnecessary.

Extract from Gunnar Holmsen's Brochure. Gunnar Holmsen, in his brochure, "Spitsbergens Natur og Historie," remarks concerning the depredations practiced by winter marauders about this time: "Lawlessness on Spitsbergen is constantly growing worse. Fishermen's houses are seized by

coal companies; indeed they have gone so far as to tear them down and carry them off. Hunting is conducted with greater recklessness than it used to be, and the wild life is being exterminated. Fishermen loot and rob when they get the chance. The provisions and the furniture left in the Russian hut at Horn Sound have been carried off, and the same thing happened at the Swedish Station on Cape Thordsen. The buildings at Advent City which were abandoned last winter have been plundered. Konsul Giæver's house in Recherche Bay was found in the summer of 1909 to have been visited by unwelcomed guests. The door was broken down and the furniture was upset. Bruce, the Scotch explorer of Spitsbergen, had the door nailed into place, and thus placarded it:—

FOUND BROKEN OPEN
NAILED UP
BY DR. BRUCE'S
SCOTTISH EXPEDITION
JULY 31, 1909
FRANK BRYCE NALSON
S. Y. CONQUEROR
OF LEITH
DR. BRUCE
DR. R. BROWN
V. BURNS MURDOCH
RESPECT OTHER PEOPLE'S PROPERTY

He proceeds to relate how the crew of the *Kutter Nor* from Vesteraal which had been engaged in a small fishing trade for many years had built two *gammer* or turf huts, one under Alkhorn in 1905, the other on the level ground on the eastern side of Cole Bay, and he makes this unsupported charge:

"The latter during the summer of 1908 was seized by two laborers from the mine at Advent Bay, and Ayer and Longyear's name placard was posted on the fishermen's dwelling. The coal companies are in constant altercation regarding their claims and properties are absolutely without legal protection."

He next gives a brief history of coal exploitation on Spitsbergen, beginning with the first load brought down to Tromsø in 1899, and the cargo of four hundred brought the following year from Advent Bay by the Trondhjem Syndicate. He describes the difficult conditions, and after expressing considerable dubiety as to the prospects of financial success owing to the barrenness of the land, and the lack of proper harbor facilities, he says: "It seems as if the Spitsbergen coal might find a market in the northern parts of Europe, but the Arctic land always presents new difficulties to such enterprises because of the harsh natural conditions, and it is questionable whether they will prove so permanent and valuable as at first was believed."

He gives a list of the various companies already organized by 1911, and shows how they were largely controlled by foreign capital, particularly American. "The largest mine at Advent Bay," he says, "belongs to the Arctic Coal Company, which has annexed tracts between Cole Bay and Advent Bay. Another company is the 'Spitsbergen Coal and Trading Company,' the property of which extends to the east of Advent Bay and joins the property of Ayer and Longyear. The latter company has also annexed Cape Boheman and holds tracts between Cole Bay and Green Harbor. This is likewise a partner in the Arctic Coal Company."

11. RESIGNATION OF BURRALL

Burrall informed Mr. Longyear that he had just signed a contract with a new doctor for a year's service at the mine. The pay would be three thousand kroner—a thousand less than what they had paid the former one—but as the doctor would take his wife along and they would have to "feed her," the saving would not be "overly much." He also informed

his uncle that he felt obliged to hand in his resignation to take effect on January 1, 1910. This decision, he said, had nothing to do with his opinion or belief relative to the Spitsbergen venture, but was brought about purely by personal reasons. He did not feel happy about it, but it seemed a clear case of duty. He could not be away from his wife so much of the time, and he had decided that he must find a job at some place where he could settle down. Moreover he thought that if the company had a man with experience in coal-mining, it would be a gain. He saw that it would be some time before the Spitsbergen property would be on a paying basis, and he deeply regretted not being able to see that result. But he felt certain that Mr. Coulson, who had a large acquaintance among coal engineers, would be able to suggest the right man for the place, and there would be plenty of time. In the meanwhile, he was, of course, prepared to work for the best interests of the company.

On April 9th he wrote that the repairs on the *Munroe* had been made. He said: "None of the planking was injured in going through the ice last year, and the only one removed was a keel plank to allow the cleaning out below." He had her cabin rearranged so as to be more convenient for guests. As soon as she should be painted she would be ready for the trip north; but he did not believe that it would be wise to start before May 15. He had learned that Nielsen and Company, the men who had bought out the Green Harbor whaling-station, were going to send their first ship up from Sandefjord on April 28, and that it was to take some of the men of the Green Harbor Coal Company (Anker's) to operate on the land claimed by Ayer and Longyear. He believed that they might be starting thus early in the hope to get there before the Americans put in an appearance, and so secure some advantage, but he did not see how they could, as it was pretty well known that the Ayer and Longyear posts were placed there some years before, and affidavits proved this. Yet they had offered Mr. Daae, who had been with the English company, and had agreed to take charge of the Ayer and Long-

year interests at Green Harbor, the position of man in charge for this new company. He suspected that they were in collusion with the new whaling company.

A Significant Article. Burrall enclosed "a literal translation" of a newspaper article referring to the proposed claim jumping of the Green Harbor Coal Company. It was as follows: "The occupied tract stretches itself in ten kilometers width from the little island 'Faestningen' (the Fort) along Green Harbor's whole West side, into the bottom of the fjord and up along the east side towards that part of Ayer and Longyear's coal-fields, which from Coal Bay stretch themselves down to Green Harbor's Northeasterly side. It is, then, a considerable property that the Green Harbor Coal Company has occupied."

He sent also a copy of a letter which he had written to Director F. Hjorth, supposing him to be the moving spirit of the trespassing company, setting forth the prior claims of Ayer and Longyear, and giving full particulars, "in the hope that future unpleasantnesses" might be avoided.

Insurance Rates. The question of insuring the *Munroe* for the season, which covered the time from June 15 until September 15, came up, and as the rate on wooden ships was one and a half per cent higher than on iron ships, the charge was likely to be eight per cent on a valuation of forty thousand kroner, or eight hundred kroner. Burrall thought that this was too high, and doubted if the company would want to pay it. The regular rate for a cargo taken on iron ships to the Arctic was fifty-five hundredths of one per cent, but there was a possibility of their getting it at a slight fraction more than that—at the most, at one percent.

12. THE NEW WHALING COMPANY

He enclosed the bill of sale to Ayer and Longyear of the lands and property which the Arctic Coal Company had bought provisionally from Lars Iversen, and also a notification which had been sent to Christian Nielsen and Company, the new owners of the Green Harbor Whaling Station, asking

them to instruct their people not to disturb the posts and buildings on those properties. "Our relations with the former occupants of the whaling station," he wrote, "have always been most friendly, and it will be our endeavor to have them continue so with your people."

A few days later, Burrall met Herre Christian Nielsen at Narvik. Regarding this interview, he wrote: "I found him kindly disposed toward us and our work and it has been agreed between us that the whole question of boundaries between the whaling company and Ayer and Longyear shall be left until means of settling such disputes shall have been appointed by the Spitsbergen Conference or other meeting of the Powers. With the understanding that it will not be pressed as a proof of claim, we can go ahead and build such small dock as we wish, so long as it does not actually interfere with the whaling company's work, and we may occupy the Lars Iversen house.

"There is also a dispute between us about the claimed Iversen property. The Whaling Company say that Iversen gave all his holdings to A/S Spitsbergen, and through them to Nielsen and Company's company, but Mr. Nielsen said he did not know that there were any papers about it. So we have nothing to lose by letting that rest until Iversen returns from South Africa whaling waters in 1911 and wants some money on the option he gave us. We will get as many affidavits as possible in this matter of stakes, etc., and ought to have a fair case when the time comes to present it to a court. And that time may never come, as it is somewhat doubtful if Nielsen and Company will have success in whaling at Spitsbergen, and if they do not, they will be glad to sell out for anything they can get. The whaling fleet will start from Sandfjord on the 20th of this month (May). Mr. Nielsen assured me that Nielsen and Company are not interested in any Spitsbergen coal companies."

Law Suit Decided. Nielsen and Company, in case the results of the whaling season were good, would want fifteen hundred tons of coal. The former owners whom the Arctic Coal had sued for coal delivered the previous summer, had

been compelled to pay in full, and the Court had allowed sixty kroner for expenses; but the lawyer's fee had been one hundred kroner, and other outlays in defense of the suit had brought the net cost to ninety kroner.

The manager of the new company at the Green Harbor station was to be Captain Markussen, who had always been friendly, ever since he was in charge of the floating station at Safe Harbor. It was reported that the company was to build a guano and cattle-food factory, and thus utilize every part of the whales. Dried whale meat, ground up fine, was said to be good for cows, increasing the milk flow.

Coal for Science. A little later—on April 28—Burrall wrote that a relative of Consul Jenssen, who was to accompany the Norwegian Scientific Expedition to Spitsbergen that summer, had suggested that it would be a gracious favor if the Arctic Coal Company provide it with coal gratis. The advantages promised were that the coal would be thoroughly tested by a Government boat; would receive wide advertisement; and make a good impression on the Norwegian people. Moreover the company would benefit from the soundings and explorations to be made in the Ice Fjord, and especially from any new coal-tracts discovered which would be turned over to the company. The director of the expedition was to be Herre Ritmester G. Isachsen, who had been in command of the smaller ship during the 1907 expedition of the Prince of Monaco, and while in charge of the work on the land had made one of the earlier crossings of the island. The Norwegian Government was to grant him twenty-five thousand kroner and the use of a commissioned ship. The other expenses were to be met by private subscription, and the object was to carry on hydrographical, geological, and zoölogical investigations in Northern Spitsbergen, and thus, in a way, offset the political effect of the Swedish Scientific Expeditions."

A Possible Advantage. Burrall saw only two objections to making this gift: They could sell all the coal to be taken out during the next two years, and, as the Swedish Expeditions had never failed to pay for everything that had been

supplied to them; if the gift was made to the one, why not to the other? On the whole, however, he was inclined to recommend it, provided the Company should receive in return title to all mineral discoveries made; that might be considerably cheaper than to conduct their own explorations. The matter, however, was to be left in abeyance until Burrall should return from the first trip to Advent Bay.

Again the matter of purchasing the property of the Spitsbergen Coal and Trading Company came up, and a real estate agent intimated that it could be bought for ten thousand pounds; but Burrall had made up his mind that it was undesirable. He wrote:

Spitsbergen Coal Under Suspicion. "The last coal they sent down, or, so far as I know, all they sent down last year, was very high in ash, said to be twelve or fifteen per-cent, and it has tended to give Spitsbergen coals a bad name. The Nordenfjelske S/S Company and the State Railways know that there are two kinds of Spitsbergen coal but they reason: the first lot brought down by the English company was good, but when they began to deliver in large cargoes it became bad, so perhaps it may happen to the American company. This idea we expect to prove wrong this summer. The chief engineer of the local district of the State Railways tells me that in spite of the high ash, the English company's coal gave good results in use, in the amount of heat delivered. We hope to deliver them a three hundred ton cargo this summer."

Some light is thrown on the governmental management of railways by the statement made that the officers in charge showed no interest in practicing economy in their purchases. They bought whatever they wanted, regardless of price or quality.

Burrall accompanied the first expedition of the year to the North on May 15, with forty-four men, for work on the island. Though there was nearly fifty miles of ice lying to the west of Spitsbergen, the *Munroe* succeeded in working through it, and on the 23d arrived at the entrance of the Ice Fjord. But here the winter ice, from four to six feet thick,

lay unbroken for a long distance out. The nearest they could get to the mine was from a point opposite Safe Harbor, about thirty miles, much of it covered with deep snow. Burrall, accompanied by three men, carrying the mail, immediately crossed to Longyear Valley on skis. He found Mangham and all the men, with one exception, well and hearty and in good spirits. One man, who had concealed his real physical condition from the officers of the Company, had died in the spring of peritonitis, and his family was not surprised to hear of his demise. Otherwise the health of the camp had been excellent.

Damage to Dock. Violent storms had occurred in December and most of January, and the broken ice had done much damage to the bridge which connected the dock with the shore. Finally half of the bridge was carried away. In spite of the intense cold, the darkness, and the weather, the men had salvaged the rails and some of the timbers. The dock itself was uninjured. When daylight returned in March the bridge was rebuilt for the most part, and piles were driven for the extension of the dock. The damage cost the Company twenty-five hundred dollars besides the necessity of taking some of the men from the mine development. Nevertheless Mangham had succeeded in getting more coal than had been expected. He had mined thirty-one hundred tons, but had unfortunately stored about two-thirds of it at the last tramway tower—Number Sixteen—nearest the dock and before a large cargo could be shipped the gravity tramway from there to the dock had to be built, and that delayed the loading of the *Locksley*. The other eleven hundred tons was in the pocket at the mine and was at once available for loading the *Munroe* for her second trip. He had agreed to take three hundred tons to put on the trucks of the State Railway at Trondhjem at fifteen shillings and three pence a ton—a price somewhat higher than was asked for English coal.

High Wages. The labor-conditions had been excellent, and the men were boasting about having been able to earn (by a contract system) ten kroner a day—which was twice as much

as the ordinary Norwegian wages for the same class of work. On the other hand, they had been working from fourteen to sixteen hours a day. Mangham reported that he was going to take nearly all the men back for the following winter, most of them having asked for places. Plenty of staple provisions were left in the warehouse, so all that had to be brought over the ice from the ship, besides the people and their effects, were meat, fish, and fresh vegetables. Four horses were available for this, and the best they could do was to make a one-way journey in twenty-four hours.

Locating Boundary Staked. They had also to carry all the provisions needed at Green Harbor. These were hauled by men with sledges—a long and difficult task. The distance was about twenty miles. He himself with two men went over all the ground claimed by Hjorth and his associates but could find none of the stakes and notices; the Ayer and Longyear post at the southwestern corner of the property and of Green Harbor showed plainly above the deep snow. A short distance south of the Ayer and Longyear house stood a 1908 stake placed there by Anker's man, Ytteborg; and north of the house were two stakes of the same date, set there by Falk-Dessen; these he removed and destroyed, directing the men in charge to put Ayer and Longyear stakes in their place. Nothing was seen of Ytteborg's main cairn (*hovedvarde*) which according to the statement filed with the Norwegian Foreign Office was "built about two meters high of stone in the form of a pyramid with a lower circumference of about eight meters" with steps leading to the top, on which had been "erected a large stake (*baal*) on which was fastened a wide board on which he, with Mr. Falk-Dessen *dook*-dealer (whatever that might be) as witness, had signed and dated August, 1908, a notification that he had taken possession of the territory." Ytteborg claimed that the cairn was so placed that it could be seen by everybody who came into Green Harbor, and that it was further protected by twelve or fourteen stakes with a similar notification on each, witnessed in the same manner "likewise the most visible possible."

Nothing of all this was seen by Burrall and his two witnesses. He took the first opoprtunity to write his Uncle, promising that if he found any of these trespassers he would in the presence of witnesses order them off and finally lay the matter before Minister Peirce, with the expectation that the American Government would uphold Ayer and Longyear in their claims, even if the claim-jumpers argued that since the original claimants did not actually occupy all the land they were not entitled to it. Burrall did not believe that any physical protest exercized against these trespassers would be wise, as it might react against the American interests in case the Conference of the Powers should be held.

All the moving of supplies was accomplished in a week, the winter men were on board ship and they were ready to return to Norway on May 31, but in the meantime pack-ice closed in on them from the north and the west and they could not get out until June 15. After repeated endeavors they slipped through a narrow belt of moving ice about five miles wide and reached the western limit of the pack, the main part of which was fifty miles wide, and arrived at Trondhjem on the 22nd.

Four days later the ship was loaded with a cargo of timber, lumber, cement, and food-stuff, and was ready to sail for Spitsbergen again, taking along also forty workmen and four members of the Swedish Scientific Expedition whom they had agreed to carry to Spitsbergen.

13. MORE TROUBLE WITH CLAIM-JUMPERS

On this trip no ice was encountered until they reached Green Harbor and off Bear Valley, but the *Munroe* succeeded in forcing her way through the pack for several miles. Burrall again visited the Green Harbor region on July 9 with one of the company's engineers, and, finding there three men who said they were working for Adolf Hoel, a member of the Norwegian Scientific Expedition, but nevertheless in charge of the Hjorth claim-jumping syndicate, ordered them off

the property and pulled up and destroyed nine sign-posts with the notices affixed. The men refused to leave, and later erected new posts. As a result of this activity on the part of one connected with the Scientific Expedition, Burrall decided that he would not use the Arctic Coal Company's permission to present it with one hundred tons of coal, as he had intended doing.

Harmless Clashes. Two of Anker's men also were found opening the coal-seam about twenty-five feet southerly from the Ayer and Longyear Pit Number Two, and a little less than six hundred feet from the entry to Mine Number One. He ordered them to stop work and get off the property. They obeyed, but were immediately sent back by Anker's representative, Nannestad, who was also met and ordered off. He refused to go or take his men away. They erected several signs in place of the three that Burrall had destroyed in his first visit in June, and stated that Ytteborg and Falk-Dessen respectively had transferred their claims to the Green Harbor Company. Burrall says in his Annual Report:

"They also put up a small portable hut about eight feet by ten near the shore, some eighteen hundred feet southerly from our first house. When Nannestad first came this year, our engineer, Mr. Daae, showed him a copy of our registered map, and explained to him whatever he wished to know about it. When I saw Nannestad I was curious to know why he should trespass upon our holdings when there is so much unoccupied land everywhere on Spitsbergen, and I was told that as we had no descriptions up he could take what he pleased. I suppose it is upon such a story that he has interested Herre Anker, but it is an absolute falsehood, for the very first of our notices he would see on coming ashore at the whaling-station, the usual place of landing, carries a proper description of our claims—a description that is perfectly plain and legible, and has been so ever since I have been at Spitsbergen.

Anker Deaf to Protests. "Anker's men worked less than two weeks and then left Green Harbor. In September I wrote him protesting against the trespass, and ordering him

to remove the hut his men had left there. The only reply was a telegraphic request for an interview in Norway with Mr. Longyear, who was at that time in England on his way to America. Anker has no men overwintering at Green Harbor, at least none had been heard of there when I left on September 29. Since leaving there I have learned that these trespassers have not confined their efforts to our Green Harbor Tract alone, Hjorth's outfit having placed stakes on the tract of the Scottish Spitsbergen Syndicate on Prince Charles's Foreland, and Anker's on the King's Bay Tract of Lord Morton's Company, where they also put up a small portable hut.

Norwegian Claims not Registered. "It might be interesting to note here that on October 15, 1908, in the presence of our Mr. Saether, Mr. Evind Blehr, of the Norwegian Foreign Office, in response to my inquiries, told me that no Norwegian claims on Spitsbergen had been registered there other than claims on two or three islands in the northern part for the purpose of gathering eiderdown and eggs."

Mr. Christian Anker himself had never seen any of the properties he claimed on Spitsbergen, or for that matter on the Varangerfjord in Norway. He trusted entirely to his lieutenants who outrageously deceived him as to the real conditions at both places.

The Green Harbor Mines. Burrall was somewhat skeptical as to the advisability of working the Green Harbor coal-seams. In Mine Number One an excavation of about fifty feet showed that the seam had a steep pitch—one foot in three, but it promised to grow flatter as the work went on; the average thickness of the coal was only about four and a half feet, on account of several rolls in the floor and roof, but this again, it was thought, would attain its former thickness. The seams and bunches of sulfur-bearing slate occasionally met with were likely to disappear as the mine was extended. From the experience gained in a series of prospecting pits extending from the first main ravine south of Green Harbor Point to about a thousand feet south of Rendal, a total distance of five miles, Burrall concluded that only one

of the two coal seams would be worth working, and that was in line with the first mine.

A new and commodious barracks for eleven men had been erected on that tract, and Burrall recommended that the outside prospecting work should be continued for another summer so as to acquire further data relative to the second or upper coal seam. He believed that the tract contained coal commercially valuable, and were it not for the trespassers it would be worth while to maintain a large force there; as conditions were, however, he opposed spending much money until the title of Ayer and Longyear was safeguarded from the Norwegians; people of other nationalities had so far respected their property.

On the third trip of the *Munroe*, Mr. Longyear and his party were passengers, and that requires a special chapter.

VII. A POLAR BEAR HUNT

1. BURRALL'S SUCCESSOR

MR. COULSON recommended as Burrall's successor a mining engineer by the name of John Gibson, Jr., who was Superintendent of a coal-mine at Jerome, Pennsylvania. He was thirty years old and unmarried—the single state being in Burrall's judgment an important consideration. He had had considerable experience in several branches of engineering besides coal-mining. He held certificates to act as mine foreman or "inside overseer," with the highest percentages ever made for such positions, and was qualified fire boss and second and first grade assistant mining engineer. He was accustomed to supervise the building of camps, purchasing of store-supplies, tools, and plant-equipment, the hiring and rating of foremen, the gathering and transportation of labor, and the caring for them on their arrival at the site of the work. He had had full charge of all accounts, the purchasing, selecting, and rating of the organization in which he acted as superintendent. He therefore seemed qualified to do the work required at Spitsbergen, and, as it happened, he was able to leave his situation without inconveniencing his employers.

He met the owners of the Arctic Coal Company in Boston, and it was arranged that he should have a three years' contract, either party to have the right to annul the contract on six months' notice. Moreover, if the mine became profitable, the manager was to receive a generous share in the yearly gains of the enterprise. In case the property should be sold the manager should receive one year's full salary.

GIBSON JOINS THE SPITSBERGEN PARTY. Mr. Longyear was to sail for Norway about the middle of July, 1909, and as it was thought wise that Burrall's successor should have

the opportunity to look over the ground, Gibson joined the party, together with Mr. Longyear's son, Jack, and his cousin, Mr. Edmund J. Longyear of Minneapolis. They reached Hull in the morning of July 20. Having two days before their steamer sailed for Trondhjem, they took an automobile excursion to Beverley, York, and Selby. They had time to visit the quaint old minster at York, where they heard the organ played, and admired the fine stained-glass windows. They walked around the ancient town walls, and read the tablets giving details of historic associations which date back to the Roman conquest. There was to be a historic pageant the next day and they saw a part of the rehearsal for the festivity in which twenty-five hundred persons were to take part. They were amused to notice a classic divinity driving an automobile, and Robin Hood riding a bicycle. The old Abbey at Selby had been damaged by fire three years before, and the scaffoldings for its reconstruction prevented them from getting a very complete idea of its beauty. On the way back they had a collision with a cow; the car came off with two bent lamps and a broken battery-box, but the cow did not even suffer from a crumpled horn.

At Stavanger. They sailed from Hull on the steamer *Tasso,* which, being of only fifteen hundred tons capacity, should have been called the *Tosso.* They found among the passengers W. L. Coulson, the mining expert whom the Company had engaged to make a thorough examination of their Spitsbergen coal properties. They arrived at Stavanger about six o'clock on July 24, and while the vessel was waiting for several hours they looked about the town and visited the stone church, dating from the fourteenth century. It was decorated with a row of stone heads across the front about ten feet from the ground. They also enjoyed the sail through the channels of the "Island Belt" with their constantly varying scenery. They passed the "Virgin Mary's Needle," which is a slender tall stone leaning toward a church, and carrying the tradition that when it falls the end of the world will come. At another place they saw "the Five Foolish Virgins," as five

tall stones, probably ancient grave stones, standing upright, are called for some occult reason, and they passed on another island, the oldest chapel in Norway, reputed to date from the tenth century. It was plastered on the outside to preserve it, and its age was indicated only by its having no windows visible.

Buildings at Bergen. At Bergen, where the steamer stopped for half an hour, they had time to visit the tower and hall of Haakon Trygvason, dating from the thirteenth century, and the church of the Hanseatic League, where the "pirates" of the same period used to seek for God's blessing on their nefarious enterprises. They found Aalesund, which though built on several islands had been quite destroyed by fire in 1905, rebuilt of brick, stone, and cement, and giving the appearance of prosperity and solidity. It was a Sunday: not a shop was open, and not even a post-card could be bought.

They reached Molde in the afternoon and found anchored there the German Kaiser's yacht, the *Hohenzollern,* with a cruiser, a despatch-boat, and two torpedo-boats, surrounded by a crowd of rowboats from the town, though it was raining vigorously. At Kristiansund there was a Norwegian cruiser which had attracted a great throng of people to the wharves. As it was still raining none of the party went ashore, but they noticed that the town, built on four islands with communication by ferry-boats and rowboats, consisted of wooden houses closely huddled together. Apparently these old Norwegian towns invite conflagrations but depend on the almost perpetual rains to ward them off. At Trondhjem, where they arrived early on the morning of the 26th, they found Burrall, Captain Naess, and their faithful chief clerk, Saether, waiting to welcome them on the quay.

The *Munroe* sailed for the North at two o'clock Tuesday morning, July 26, and arrived at Tromsø at seven on the morning of the 29th. Here as usual the Lapps collected with their wares, and Master Jack Longyear bought a Lapp woman's cap, made of bright blue, red and yellow cloth, with an inch-wide band of fur encircling it. He wore it through the

town attracting much attention, and as they sat in the small park a crowd of children gathered around. Mr. Edmund Longyear instituted a foot-race among the boys for a ten-øre coin; but several older people came and rebuked the children for their apparent rudeness to the strangers! The strangers, however, who were enjoying themselves, were surprised at such superfluous strictness.

They left Tromsø a little after ten in the evening, and the captain remarked that the sky indicated wind. His prediction was fulfilled, with the result that movable articles developed a tendency to "skate" across the cabins, and the passengers had to cling with both hands if they tried to move about. Several of the party, including Master Jack, evinced a disinclination to partake of breakfast or an undue alacrity in sharing it with the fishes.

A Fragrant Welcome. On Sunday, August 1 the ragged peaks of Spitsbergen were in sight about thirty miles away, but seeming not to be five, the air was so clear. A "finner" whale came up within thirty feet of the ship, having evidently passed under it. His breathing could be plainly heard for some time.

The *Munroe* arrived at Green Harbor at two o'clock on the morning of the next day, and met a whaling steamship towing nine dead whales, one so distended with gas that it looked like a captive balloon. The stench was appalling. Several flensed whale carcasses were floating in the glassy water contributing much to the odors in the air. At the little camp the American flag was run up to the staff top on the approach of the ship.

A Visit to the Green Harbor Mine. Mr. Longyear and his party went ashore, and climbed up to the elevation of five hundred and seventy-five feet to the main opening of the mine. They penetrated to the very end of the "drift" which had been driven in for a distance of about one hundred and eighty feet. As the tunnel was less than forty-four inches in height, they had to go crouching all the way. The temperature in the mine was below freezing, and wonderful ice-

crystals, two or three inches wide and looking like soft white feathers, covered the top and sides of the drift, and when touched by hats manifested a tendency to drop down the necks of the explorers. The coal-seam stretching along the side of the steep slopes of slide-rock appeared to be of remarkably even thickness. It was regarded as excellent steam-coal but not of such prime quality as that at Advent Bay.

At Advent Bay. They arrived at Advent Bay at ten o'clock in the morning. In the afternoon the party climbed the steep zigzag path up to the mine. At the main-entry, and at the junctions of the cross-entries, where the tramway tracks were laid, the height of the entry was about six feet and it was comfortable walking, but they had to stoop again when they reached the "long wall face" where the mining was conducted, the floor and roof being only forty-four inches apart. The length of the entry was thirteen hundred and fifty feet, and the last part of the way the air was thick with powder smoke.

Scene at the Dock. The activities at the dock were very interesting. The *Laura,* a steamer chartered by a party of Austrians engaged in hunting reindeer, was tied up alongside of the *Munroe,* and was filling its bunkers with coal. It had four live young Polar bears aboard, and the rigging was hung with musk ox hides and heads, together with the skulls and skins of walrus, seals and other animals. Even the lifeboats were filled with skeletons.

As the *Laura* cast off in turning around, she was "sawed" back and forward on a hawser for an hour within a hundred feet of the dock, to the imminent danger of smashing the jibboom of the *Munroe.* The trouble was that the captain and all the crew were drunk. An attempt was made to tie up to the *Munroe* again, and when this was forbidden the captain became profanely abusive, but he finally turned his ship around and steamed out of the bay. It was thought that he was afraid to return to his people at Green Harbor, whom he had left to continue their hunting, until he had sobered off.

COAL DOCK AT ADVENT BAY IN 1909

STAFF-HOUSE, LONGYEAR CITY

The English Camp. On Tuesday, August 3, Mr. Longyear and his party went in the steam-launch across the bay to the English camp where no work had been done for a year, three men being left in charge; one was the cook for the other two, both of whom they found had been drunk for two days. As Coulson wanted to examine the mine, they climbed the mountain by a zigzag path. The mine was situated about three hundred and sixty feet above the bay. A single glance sufficed to show why the English company were doing no more work there. Mr. Longyear's diary says:—

"The vein has as much rock as coal, both being in alternate layers of from four to sixteen inches each. The expense must have been tremendous, and only half the product was salable. There were illustrations everywhere about the place of 'how not to do it.' The whole thing was a melancholy looking 'layout' for the money that has been spent.

"In many places the drifts were partly filled with rock which has fallen from the roof, and in some places we saw crushed timbers showing that the hill above the mine has begun to settle down into the openings. The accumulations of frost-crystals in some places hung down a foot from the roof, and we got many showers of them because of not stooping low enough. The idle electric wires looked like feathery crystal cables, two or three inches in diameter, as if the frost fairies were getting up Christmas-tree decorations."

The cook asked permission to go across to Advent Bay in the launch, and he took a boat and one of the men to row him back. While proceeding to the launch they nearly upset. The cook was big and clumsy; the other man was big and drunk. Mr. Longyear was much impressed by the Providence that seemed to watch over inebriated Norwegians: he said that a sober one could navigate anything that would float, but he had never seen a drunken one get wet by falling overboard.

In Longyear Valley. The next morning some of the party made an examination of the glacial débris in the bed of Longyear Valley, and then climbed to the upper seam which

is situated about sixty feet above the main mine. The trail was so steep that they had to go on all fours, like mountain bears. On the way three young ptarmigans were started up, and were so tame that they let Mr. Longyear approach to within twenty-five feet of them. Even then they did not attempt to fly, but walked off with graceful dignity. Another flock of a dozen started up a little farther away. On one place over eight hundred feet above the sea Mr. Longyear found a fresh fish like a bullhead, with small horns on each side of its head. It had probably been dropped by one of the birds that nest on the high mountainside.

The upper mine had been opened sufficiently to give some idea of its quality. It consisted of two seams, separated by about six feet of shale; the lower seam is more than three feet thick; the upper, five feet six inches of clear coal. Streaks of fog were blowing up the valley and occasionally enveloped the visitor; then floated away again, leaving wide vistas of desolate, ragged landscape.

It was even more difficult to descend than to climb up; but by sitting down on the slide-rock, and using a little pick and a staff, Mr. Longyear reached the mine trail without starting an avalanche. It had been planned to build a number of huge coal-sheds near the mine to shelter the winter output of coal, so that the melting snow would not cake it into a solid mountain very expensive to free from ice; but Mangham had tried the experiment of having two thousand tons dumped on the bluff directly under the ropeway, where he had noticed that the snow was swept away by the wind. This coal thus winnowed, successfully weathered the winter, with only a small accumulation of ice, and the method was thenceforth adopted at a great saving of cost.

2. OFF TO THE EASTWARD

As Coulson required about a fortnight to make a thorough examination of the mine, and needed no assistance, Mr. Longyear took the *Munroe* and with his son and his cousin made an excursion to the east of Spitsbergen in the hope to bag a

few polar bears on Kong Carl's Land. They took on a hundred tons of coal delivered by the aerial tramway at the rate of sixty or seventy-five tons an hour, though there was some delay because supplies had to be sent up to the mine in the empty buckets and moreover the trolleys twice jumped the track; but, on the whole, the apparatus worked satisfactorily for new machinery.

The steamer sailed about midnight of Wednesday, August 5, and the next morning they were swinging along easily over the long swells off Bell Sound and by nine o'clock were passing the South Cape where the wind freshened from the northeast and cut like a knife. Fog was never far away and the low-lying clouds shut off the view of the mountain-tops. In the afternoon glints of sunshine occasionally played about but not long enough to communicate any warmth to the atmosphere. Turning in with all one's clothes on and piling two pairs of double blankets with a steamer-rug on top of all was one way of escaping the searching wind which was, moreover, kicking up an ugly sea.

On the morning of August 6 they were in the middle of Stor or Great Fjord, known to the old Dutch whalers as Wybe Jans Water or Wybes Gat and by the Russians as Titova Gubá. It is eighty miles wide. The captain reported meeting an iceberg more than one hundred and fifty feet in height a few hours earlier and that the current was so strong that he had to run some distance to the south to avoid it. All the morning they kept encountering icebergs and floes. Many seals were swimming in the water; they prefer to come up on the ice only when it is sunny.

An Arctic Hunter. Toward six o'clock in the afternoon the *Munroe* stopped close to one of the many hunting or fishing smacks that cruise in those desolate waters and the skipper came aboard to have supper with Captain Naess. He reported that he had been hunting for weeks with little luck: the ice was solid to the east of Hope Island. This was not exactly disquieting news; if there was ice there would probably be bears.

They passed Hope Island about midnight and could just distinguish its snow-covered mountain-spine through the fog.

Mr. Longyear's letter-diary gives a vivid picture of the scenery under the pall of fog:—

Spitsbergen Fog. "The sea was covered with scattered fragments of ice, in size from slush up to a few feet across and occasionally a good-sized iceberg. A long smooth swell kept the ice bobbing up and down in an aimless, foolish-looking way. The forms of the ice were curious and often beautiful. The wonderful light blues in some of the heavier ice-packs were very attractive but they looked cold. As the ice-forms came bobbing at us or near us out of the fog they often looked weird and ghostly. The silence was tremendous and it was a relief to get where one could hear the machinery, if it were running. Seals were in sight continually."

About noon of the 7th they met with seven sealing-smacks; the skipper and first-mate of one of them were brothers of Captain Naess.

The First Polar Bear. On Sunday, the 8th, about four o'clock in the afternoon, the Captain rushed into the cabin and uttered the significant word "Bear!" They were about fifteen miles to the south-east of Hope Island. From the deck with the field-glass they could see his bearship asleep on a small iceberg less than half a mile away. Armed with kodaks and rifles the huntsmen got into a boat which was rowed by two men, the captain standing in the bow to give signals to them in threading the channels through the ice. When they reached within one hundred feet of the bear, the Captain told them to be ready; he then gave a yell. The bear rose to his haunches. Mr. Longyear snapped his kodak at the huge creature, which he said "looked as big as a church," and Mr. Edmund Longyear fired. The bear fell apparently dead, but in a moment leaped up, ran across the iceberg and dashed into the water beyond, swimming with astonishing vigor, although he was fatally wounded. It took the utmost exertions of the two oarsmen to keep up with him as he made off. He frequently dived under the floes, coming up on the

PANORAMA LONGYEAR CITY IN 1909

other side while the boat had to go round. Mr. Edmund Longyear fired seven times at him but it was not easy to hit a rapidly-moving target from a cranky boat which was bumping against big lumps of ice every few seconds. Four of the shots told, however, and the fourth "did the business." Wounded bears do not sink like wounded whales and seals; so the men fastened a rope around the bear's neck and towed him toward the ship. It was estimated that he weighed about seven hundred pounds. In an hour's time the Norwegian hunter, Paul Bjørvig, had skinned and dissected the big creature; the edible parts were hung on the rear boom, the skin was folded and the rest was dumped on the ice for the scavengering gulls.

Paul Bjørvig. This man, Paul, was one of the two caretakers whom Wellman left at Dane's Island the previous winter. They were out one day walking together on the ice when the other of them fell into a crévasse and was never seen again. Another time he had been left with a single companion to winter at Wellman's camp on Franz Josef Land. The companion was stricken with scurvy and when he was dying begged Bjørvig not to bury him in the snow where the bears or foxes could get at his body. Paul promised; in order to keep his word, he let the fire go out and for three months lived with the frozen corpse lying in the bunk where he died. How he himself kept alive and did not perish of the terrible cold was almost a miracle. When he was at last relieved he was out of his mind but he ultimately recovered. He related this gruesome experience as if it were a commonplace of Arctic adventure.

He had a weatherbeaten face, surrounded by a reddish beard turning gray, a bushy mustache, and an expression of contented good-nature. He was famous for his skill in skinning wild animals which he accomplished with the greatest despatch.

About six o'clock of the same afternoon Captain Naess called attention to a big deep-sea seal on the ice some four-hundred meters ahead. Master Jack took the Krag gun to

the bow of the ship and shot at it. The seal gave a jump and slid off into the water but it was impossible at that distance to tell if it were wounded or not: wounded or dead seals always sink immediately.

Bear Number Two. Two hours later again the captain appeared at the cabin-door with the joyous cry: "Bear!" From the rear-deck the huge animal could be seen standing on a cake of ice less than a quarter of a mile away. It was Mr. Longyear's turn to shoot; but by the time his gun was ready, the bear had run across the ice and taken to the water. The excited sailors in the boat left the ship without Mr. Longyear or a gun. So the captain shouted orders to the boatmen to row around the bear and drive him back toward the vessel. As the boat got near the bear they poked him with a pole which he bit at savagely. The vessel was slowly swinging toward him and Mr. Longyear, running to the bow and after waiting until he as out of the line of the boat, shot at him from the forward deck, but missed him. A second shot, at a distance of a hundred yards or so, killed him with a bullet through the neck. He was a "three-year-old" with splendid teeth but rather smaller than the first one. Still another was seen a few minutes later but was too far away on solid ice for pursuit.

When they got up the next morning the decks were covered with three inches of new-fallen snow; the rigging and metal hand-rails were ice-bound.

A Convention of Seals. The weather continued thick and snowy for about thirty hours and no bears could be seen even had they been on the ice. About noon of the tenth they fell in with the sealing smack *Moder* which Captain Naess had commanded twelve years previous. The skipper came aboard the *Munroe* and got a sack of potatoes. He had been cruising in those waters since the eighteenth of April and declared he had not seen a single bear, and his crew had secured only nine hundred seals during the summer; they should have caught twenty-five hundred or three thousand "to make a good season."

The next day, Wednesday, the 11th, the captain woke Mr. Longyear about four o'clock to see the seals, "gentlemen," as he called them, on the ice. At this time of the year the males flock by themselves and hundreds of them had gathered at this place as if they were holding a political convention. They were of the Jan Mayen variety about four feet long and were considered by the hunters the most desirable of all.

As the captain was lamenting that his brothers' smack was fifteen miles away and that after four months' hunting he was likely to miss this great chance, Mr. Longyear suggested that they should go back and tow his smack to the hunting-field. This was done and four hours later the *Flora den Blide* (*Flora the Gentle*) was following the *Munroe* at the end of a towline. The captain reported that several other smacks were in sight when he took the *Flora* in tow and that their crews were in a state of great excitement, men running up the rigging and crowding to the crow's-nests to spy out "what was doing."

When they reached the seal-convention again two boats with four men each were sent to the floe and the *Munroe's* boat followed to see the hunt and take photographs. The "harpooners" used rifles. Mr. Longyear says:

A Seal Hunt. "The boats would approach a piece of ice on which the seals were lying. As the boat got near all but the man in the stern (who did the steering and part of the propelling with a pair of oars pushed instead of pulled) crouched down in the boat. The harpooner fired over the bow of the boat as soon as he was within range. The shooting was remarkable. There was some swell, so that the ice and the boats were continually rising and falling several feet, but at least two-thirds of the shots were killers and every dead seal I saw—and I saw a lot of them—was shot through the head or neck. A diagram of all the shots I saw would come within an eight-inch circle. As fast as the seals were killed they were thrown into the boats. Each boat could carry about eighty 'round' seals or one-hundred and twenty skins and blubber. I saw them skin one seal: it did not take more

than two minutes to get the carcass separated from the skin. It was a bloody piece of work but done with remarkable celerity and precision."

Happy Huntsmen. They followed the hunt for two hours or more. There was considerable fog but they could see the sun all the time, though often the two vessels were hidden from each other. After a while the spectacle became monotonous and they bade the hunters good bye, and returned to the *Munroe*. "The hunters," says Mr. Longyear, "were a happy-looking lot of men: their smiles could have been tied in double bow-knots behind their ears as they shouted: 'Adieu, ti tusind tak' (Good-bye: ten thousand thanks).

Paul Bjørvig was the noblest man of them all; he pulled with strong rapid strokes into the fog and among the beautifully-colored little icebergs which dotted the smooth water. They were beginning to wonder how they would find the vessel when they suddenly saw her three masts sticking up above the fog a little to port of the course they were running and just then the captain blew a loud blast on the whistle.

Among the Thousand Islands. They soon were under way again, pushing through floes of ice toward Edge Island and the "Thousand Islands." The south-west extension of this land is split into two high promontories by Decrowe or Deicrow Sound ending respectively in the capes called Whale's Point and Negro Point. They were mapped first roughly by Carolus in 1614 and more accurately on the Muscovy Company map of 1625. The sound itself, like most of the Spitsbergen waters, bears several names. It was first called after Benjamin Decrowe who "was a leading man in the Muscovy Company." Sir R. Dudley named it G. Athale in 1630. Middelhoven dubbed it London Bay in 1634. Doncker, the Dutchman, on his map gave it the name of Deeve Bay and it is sometimes still so designated.

They passed Whale's Point in the late afternoon of the next day and sailed within four or five miles of the island, running into Stor Fjord and having a fine view of the peaks and mountain on the west side of it. There were occasional

THE FIRST BEAR WAKING UP

THE FIRST BEAR COMING ABOARD. PAUL BJØRVIG AND E. J. LONGYEAR

patches of open water but for the most part there was much floating ice; one iceberg was almost rectangular in shape and more than seventy-five feet in height above the water. There were many big seals, perhaps twice as long as those of the Jan Mayen species. Mr. Longyear gives a lively description of a squabble between two mother auks, each of which was accompanied by a chick: "One chick had gone around a piece of ice and got out of sight: both mother-birds claimed the chick in sight and things were becoming lively when the missing youngster appeared again and made all serene."

Would this seem to indicate that the mother-instinct was not strong enough to distinguish between their young. And if the chick had been really lost would it have required a bird-Solomon to decide the matter of ownership. It would certainly have been an awkward dilemma.

Glacial Ice-caverns. As the ice was solid in Alderman Freeman Inlet, they decided the next morning, August 15, to follow the west side of the Sound and at breakfast-time were opposite Agardh Bay. The coast which was fifteen or twenty miles distant seemed to be only five. In the afternoon Mr. Longyear, expressing a desire to land and examine the side of the great Davis glacier, the ship was turned to the shore and frequent soundings were taken, showing depths of thirty, twenty, eighteen, eighteen, sixteen, twelve, thirteen, thirteen and forty fathoms, with deep water close to the glacier the face of which is more than twenty miles long and filled with many wonderful ice-caverns.

False Charts. The captain took a number of bearings which showed that, according to the British Admiralty map their course "was about four miles inland and over mountains." The chart also indicated "a low, flat island" but they sailed directly over its site: it had either disappeared or had never been there. Taking two sailors to row the boat they paid a visit to the glacier: landing on a gravel beach at the south edge of the ice at the foot of Mt. Belcher they walked for half a mile along the tremendous heaps of talus which had slid down from the stratified cliffs of shales and sandstones.

Many interesting fossils were scattered about and they loaded themselves with them. These apparently indicated that coal-beds extend entirely across Spitsbergen. After they left the shore and were rowing out to the *Munroe* which had run down to meet them, a huge mass of ice five or six hundred feet long and enormously thick, the whole height of the ice-cliff fell roaring and crashing into the water:—

A Calving Glacier. "The noise was as of heavy thunder, spray flew half as high as the cliffs and a huge wave of foaming water was driven from under the ice. In a few minutes the effect reached us in the shape of a huge smooth swell at least twenty-five feet high which passed on toward the open ocean. It was still going, the last we could see of it. We had been wishing that we might see a section of the glacier fall and the show was timed just right for us to get a fine view of it. Ed and I had exhausted the films in our kodaks, but Jack managed to get a snap at the last of the foaming wave. During the afternoon we had heard heavy reports, like artillery, especially near the caverns, but no large masses of ice fell. We concluded that the reports came from fissures forming in the ice; these are numerous near the cliffs and are preliminary to the final plunge into the waters of the fjord."

The Midnight Sun. A little later while they were engaged in getting photographs of the midnight sun, this being practically the first time he had showed himself fairly unobscured during their trip, an iceberg, with a flat roof supported by pillars, and beautifully reflected in the glassy water, collapsed within half a mile with a crash which made them realize that it was much huger than it seemed. Sense of proportion among objects so colossal is easily lost.

Russian Huts. The next day they landed in Goose Haven which the English called Boule's or Bowles Bay in Horn Sound, a region once famous for its Russian frequenters. In 1818 the winterers slew more than eighteen-hundred walruses, making an unusually successful hunt. There were ruins of two outpost huts for five men each, besides remains

of others; many skeletons were discovered by the Swedes in 1861 and 1864.

The Russian Government had built a station there in 1898; it had been used for two winters by a corps of experts making scientific observations but not having been occupied for several years, it was badly wrecked.

Ruined Laboratories. "Some of the small buildings," says Mr. Longyear, "are in fair condition. Three or four seem to have been used as laboratories with brick piers for instruments and the like. The heating seems to have been done by brick stoves which are still in place and generally in good condition. A large living-house was in a tolerable state of preservation as far as could be seen. Doors and windows have been left open and the rooms are full of ice and snow solid within a foot or so of the ceiling. Where we could walk along the corridors we waded in water two or three inches deep. I saw the corner of a kitchen-range in place; but mostly covered with ice. A signboard on the outside of the large building bears a legend in English and Norwegian to the effect that the buildings and contents belong to the Russian Government but that in case of extreme necessity persons are welcome to use them. In view of the present unusable condition of the plant the notice seemed a little sarcastic.

A Fragrant Winter-hut. "At the west end of the gravel beach, about a mile from the Russian buildings is a hunters' winter-hut. We visited it and although it has not been used for two years the odors from the musty carcasses of foxes and birds lying in heaps by the door were such as to cause us to cut our visit short. We saw several mounds along the beach marking the sites of old whale-boileries and many huge bones of whales were scattered about. The hunter had covered the living-room of his hut (about twelve feet square) with moss-sods, earth and so forth, and to keep them in place had piled stones and whalebones in a wall outside the sods. The bones were larger and easier to handle than the stone.

"Near the hut, on the top of an old boilery mound, was a

Russian cross marking a grave—probably one of the colony that occupied the governmental building in 1898-9.

"At the west end of the beach is a huge outcrop of dark gray quartzite thickly veined with white quartz. It dips to the west about sixty degrees and seems to run nearly north and south."

An attempt was made to penetrate to the head of the sound but the accumulation of ice and icebergs was so great that it prevented the steamer from reaching nearer than two miles of the glacier at the head of the sound and they landed at the foot of a lofty cliff of serpentine. Having secured some specimens of the rock they returned to the ship.

Glaciers in Horn Sound. There were four or five big glaciers at Horn Sound and they frequently heard the booming of cracking ice. One tremendous report like thunder lasted for more than a minute but they could not see the glacier "calve," as it was probably around the corner. When the ice first comes into contact with salt water it makes a strange snapping noise "much like the spattering of heavy drops of water falling into a pool."

They watched a lively battle between two small gulls in the air. One had picked up some food and the other was trying to make him drop it. The result of the combat was not decided before they lost sight of it.

The Three Hunters. Mr. Longyear relates a remarkable incident which was indirectly connected with his cruise in the ice while they were trying to reach Kong Carl's Land to hunt bears there. It was related to him by Burrall the following winter. It seems three hunters had been left on the island in August or September of the previous year with provisions and ammunition enough to last them a twelvemonth. They had met with fine success, having bagged eighty-two Polar bears and many other animals. Their smack had returned from Norway and had been cruising about all summer waiting for ice-conditions to improve so as to get within reach of them and bring them away. As this was impossible the skipper arranged with some seal-hunters to rescue these

TOWING A SEAL-HUNTER TO THE SEALS

men if opportunity offered, and returned to the south. Mr. Longyear continues the narration:—

"When these hunters saw our steamer moving about in the ice, they supposed that we were trying to reach them, and when they discovered that we had gone away they had despaired of being rescued. They did not have provisions enough for another winter and were in a desperate situation.

A Difficult Journey. "Two days after the smoke from our steamer had disappeared from their view they undertook the perilous journey across the ice. They carried what few provisions remained to them and dragged a light boat with them. In this boat they would cross such open water as they found, the rest of the journey being across more or less broken-up ice. They reached Edge Island, where they killed reindeer for food. On the journey they also ate birds which they shot. All flesh was eaten raw, for they had no means of cooking. From Edge Island they crossed the fifty or sixty miles of open water of the Stor Fjord and reached Agardh Bay, this being the point on that side of West Spitsbergen nearest to our mine.

"They abandoned their boat here and crossed the glacier at the head of the bay into Sassendal; down this valley, which at this time of the year is comparatively free from ice and snow, they traveled to Sassen Bay, then crossed the peninsula between Sassen Bay and Advent Dal, down which they pushed until they reached our mine—having been forty-two days on the journey. They reached the mine the day before the last steamer of the season left for Norway.

Its Successful Issue. "Aside from fatigue the men were in good condition, notwithstanding their six weeks' diet of raw meat. Had they been one day more making the journey they would have been obliged to put in another Winter on Spitsbergen, but they would of course have received food at the mine and probably have been able to do work and earn wages.

"This journey is one of the most remarkable I know of in the history of Arctic life, but as far as I know it has never

been published, though it is possible that the Norwegian papers at the time contained some account of it.

"Had we known of their presence on Kong Carl's Land we should have made more earnest efforts to get through the ice; but it is perhaps just as well we did not know, as it would doubtless have been impossible for the steamer to make its way through the forty miles of densely-packed ice-floes."

3. EXCURSIONS IN NORWAY

The party returned to Advent Bay on Sunday, August 15, and anchored a short distance from the dock. Near the *Munroe* lay a little hunting-smack and the small steamer *Conqueror*, belonging to a Norwegian expedition engaged in exploring Prince Charles's Foreland, while tied up at the dock was the steamer *Locksley* which was taking on the first big cargo of coal from the mine: it would carry eighteen hundred tons.

At Green Harbor Again. Early the next day they started for Green Harbor, arriving there at eight in the morning. New coal-pits had been dug since their previous visit: these were about two miles South of the main opening. They visited also their southwest claim-stakes on the other side of the harbor beside the west edge of the South glacier.

While they were at dinner the *Munroe* ran down opposite to two new openings in their coal-claim about four miles distant from the others and 464 and 505 feet, respectively, above the sea. They landed also at Coles Bay but found their man absent; they visited some of the claim-stakes here and while they were doing this Master Jack climbed part way up the shoulder of Nordenskjöld Peak.

Coal at Bear Valley. The next day, August 17, they visited Cape Boheman, where owing to shoal water they were obliged to anchor two miles from the shore. Nine persons piled into the hunting-boat but the wind was so fresh that in a quarter of an hour four oars had got them only two or three times the length of the ship and the water was so rough that they were all beginning to be soaked. As the trip would have taken several hours, the object of the visit was not deemed

of sufficient importance to subject the party to such discomfort. So the steamer was run back to the south side of the fjord and landed at the base of high cliffs two or three miles west of Bear Valley. There they inspected two seams of coal or, more likely, the same seam in two places and walked a mile or more along the narrow gravel beach under the foot of the cliffs. Here the water was so deep that the ship could approach close to the shore.

After dinner, though the wind had increased and it was raining, several of the party went ashore and climbed up the side of Bear Valley to a height of several hundred feet to examine some coal-outcroppings.

A Good Bag of Game. On their arrival at Advent Bay, several of the party went hunting with Captain Naess around the head of the bay and returned in two hours with four eider-ducks, eleven *krykker* or kittywakes and two *havheste* or "sea horses" (fulmars). After they had expended all their ammunition a flock of gray geese came within range and went off again. The company at table next day thought that the krykker were better eating than the eider-duck, but more delicious was a plate of *rype* or Arctic grouse, which was served at the camp.

When the *Locksley* with its full lading of coal sailed on August 20, the *Munroe's* flag was dipped and a salute of three bombs was fired in honor of the first big shipment and in compliment to Mr. Coulson, who had finished his examination, and was taking his departure on her. Mr. Longyear judged from conversations and discussions with him and the manager that the prospects of the mine were "pretty good."

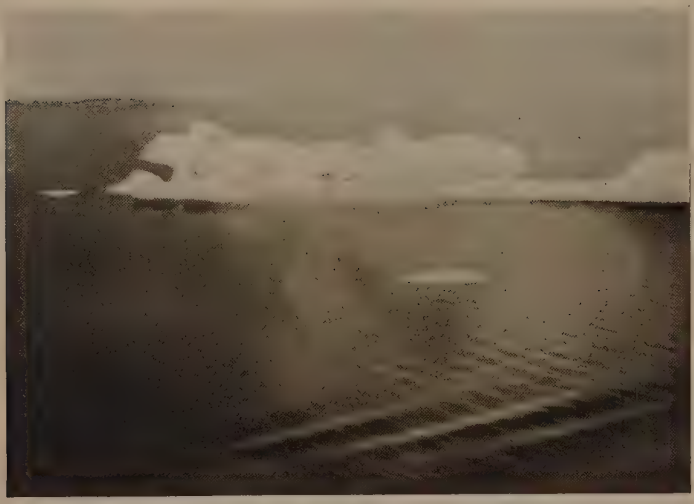
On the Tableland. During that afternoon he and his cousin climbed to the top of the tableland above the mine, where at heights of twelve hundred to sixteen hundred feet they ran a compass-line northwesterly in the general direction of the mine-development to the banks of a deep ravine, and found that the main-entry would reach there in about a mile, and would act as a fine ventilator when the opening was effected.

They followed the ravine to its head and returned to the ship, walking, in all, on the plateau about two miles, almost every step of the way on stones broken into sharp angular slabs or in coarse gravel. Limber, lumberjack rubbers, even when worn over three pairs of stockings were not very well-fitted for such rough going; soft spongy wet moss or sloughy mud was preferable and when it occurred was a great relief to weary feet. They might have ascended the great Nordenskjöld Peak, the slopes of which were before them, but they had had enough of rough walking for one day.

At Cape Boheman. The next afternoon, toward half-past seven the *Munroe* ran over to Cape Boheman again to allow an examination of the coal-deposits which the heavy wind had prevented Mr. Longyear from visiting when on his way back from the hunting-expedition. This time they again anchored two miles out and three stout sailors rowed the party ashore at a place where there were black shales which they examined. On the way they passed a small island where many terns nested and the air "was full of squealing, protesting birds." They caught some of the young ones, rousing a storm of indignation in the parent-birds, which followed them for some distance constantly swooping down at them. But when the boat had passed beyond their "danger-line" the old birds went back to their haunts. The young terns manifested almost no sign of fear but would lie flat on the ground and hardly move, with great equanimity letting themselves be picked up and replaced on the ground after being examined.

Ginkgo Fossils. They also visited a seam of coal which outcrops on the beach and there they found many fossil rushes, grasses and leaves carbonized and pressed into yellow sandstone. Some of the leaves were said by Swedish geologists to be those of the Ginkgo-tree, such as Dr. Oliver Wendell Holmes found on Boston Common, imported from Japan.

Early the next morning, August 22, they anchored in Green Harbor once more and spent an hour there talking with their Norwegian manager of that mine, Herre Daae, and deciding many of the puzzling questions regarding the



ICEBERG IN STOR FJORD

ICEBERG IN STOR FJORD

work there and the manner of dealing with the so-called "claim-jumpers" and then they headed South and arrived at Tromsø after an uneventful three-days' passage, the chief detail of unusual interest being a clear view of Bear Island which they passed within half a mile. The almost perpendicular cliffs rising to a height of fourteen hundred feet were sublime and beautiful; the big gulls flying about the tops looked like sparrows. The steamer ran in close enough to afford a good view of the two isolated tower-like rocks standing in the water under the cliffs.

Early in the morning of August 28 they steamed by "the Goat," as the Norwegians call the four-story red-brick lighthouse at the entrance to Trondhjem Fjord and at noon arrived at the dock. Saether came out in the pilotboat to bring them their accumulated mail.

Old Trondhjem. Saether devoted himself to entertaining the Americans. He and an architect, thoroughly versed in the antiquities of the region, showed them the ancient town, dating from about the year 1000, A.D., with its narrow, crooked streets still lined with wooden houses, where no less than seven great conflagrations have raged; yet the conservative inhabitants refuse to have the streets widened and straightened. One of them, where the royal palace formerly stood, had the historical honor of commemorating the assassination of a famous strong man, who could bend a larger bow than anyone else.

The architect took them also to the hill where stood the ancient stone fortress Kristiansten, now used only as a powder-magazine and fire-outlook where stand two antiquated cast-iron cannon which, mounted on symbolical red-painted wooden carriages, are used to fire salutes and to sound fire-alarms.

The part of the town on that side of the river, he told them, had been often captured by the Swedes in their wars with the Norwegians and was the scene of civil wars between rival chiefs and between the Christians and heathen when Norway was converted by the free use of the sword *à la* St. Olaf. A small wooden red-roofed church was pointed out as stand-

ing on the site of an ancient heathen sacrificial altar; this edifice was the successor to several others, the earliest of which was built in the tenth century.

A Decorated Arsenal. They went to what was once an archbishop's palace, now turned into an arsenal. Several of the rooms had barrel-vaulted ceilings and the ancient banquet hall, an arched chamber about thirty feet square, still displayed the curious and interesting frescoes painted prior to the year 1600. These represented red deer pursued by red-clad hunters, red dogs and red horses through a maze of huge black roses and arabesques while a big black bear was attacked by more of the red dogs. Mr. Longyear thought the artist that created these masterpieces was hardly the equal of Rafael and that he must have employed a whiskbroom instead of a brush.

They spent an hour or two profitably in the cathedral and then went by motor-boat to the island of Munkeholm, now a place of resort, but in the eleventh century the site of a monastery which gave it the name. In the seventeenth century it was a prison and in one of its six cells was confined for eighteen years Count Peter Griffenfeldt, Minister to King Christian IV. On the way back it was raining so briskly that they had to stand up in the motor-boat, two under each umbrella.

To Hell and Back. The next day Saether took them on the train to Stenkjaer, a four-hour's trip which is rather remarkable because the route goes through Hell; the houses of this suburb were built of wood and it boasts of a climate so cold that blankets and overcoats were indispensable in midsummer. Perhaps it is like the Hell depicted by the famous Spanish preacher Boca de Oro, who, when he discovered that his auditors were rather attracted than scared by the idea of a hot place, reversed the climate. There they got good milk and coffee as well as bread and meat. Their route took them along the south and east sides of the Trondhjem Fjord revealing a succession of charming and beautiful views of mountain and water, of forests, wild crags, cataracts, and

prosperous-looking farms with white houses and red and gray barns in ever-changing combinations. Mr. Longyear says:

Lively Maneuvers. "We met a lot of artillery companies coming from the annual maneuvers, where the wagon-road and railway were side by side. The farm horses, impressed into the service for the maneuvers, did not like the train and we had glimpses of one six-horse team trying to pull a gun up an impossible bank, the drivers wildly sawing on the reins, an overturned ambulance, guns, horses, men, caissons in the ditch; but did not see the end of it."

An Ancient Sanctuary. Stenkjaer, a town of fifteen hundred inhabitants, is situated at the head of the Fjord and was once the seat of the *Thing* or popular Legislature in the days of old. The scene of this ancient assemblage now lies in a private yard. There used to be about forty big stones placed in a long oval about one hundred feet long and twenty-five feet wide; the end stones have disappeared and only thirty-six are left. Some of the highest ones stand five feet above ground and the largest must weigh as much as two or three tons; none of the smaller weighs less than a ton.

Old sages tell of *Thing* that were held there and some antiquarians believe the space enclosed was sacred to the members. No fighting or quarreling was allowed within the enclosure and it served as a refuge or sanctuary for fugitives.

It occurred to Mr. Longyear that it might mark the grave of a viking, the shape being something like the form of a ship. It is also possible that it was connected with the religion of the Druids.

A Millennial Farm. On the top of a steep ridge a mile or more from the town, was a farm which had a continuity of history covering more than nine centuries and the soil was still fertile. Just as in Italy and some parts of Germany men take their titles of nobility from their landed possessions, so here farmers take for their last names the names of their farms, and if a man moves from one farm to another he changes his name accordingly. Saether, commenting on this custom, remarked that it caused endless confusion and was

continued, like so many other Norwegian customs, simply because "it had always been done that way." For this reason it is impossible to trace most genealogies back beyond the memory of living people.

On the crest of the ridge stood a little church and cemetery. In it was an old granite *bautasten* or gravestone covered with moss and lichens.

Interviews at Kristiania. The following day Mr. Longyear left for Kristiania where he had several interviews with the Honorable Herbert H. D. Peirce, the United States Minister and Envoy Plenipotentiary, who showed a great interest in the American coal-enterprise in Spitsbergen. The project expelling the trespassers by force was discussed and it was suggested that in case of trouble a cruiser might be sent by the United States Government; but Mr. Longyear was convinced in his own mind that the Government at Washington would be very loath to run any such risk of collision with a friendly Power and he had no desire to follow such a course.

Mr. Peirce had been Secretary of Legation and Chargé d'Affaires for some years at Petrograd and since 1906 was stationed at Kristiania. He invited Mr. Longyear and his son to dinner; late in the evening Sir Arthur Herbert, the Ambassador from Great Britain, came in and the three men informally discussed Spitsbergen affairs. Mr. Longyear gathered from this conversation, though it was conducted with perfect discretion on the part of the two Ministers, that Sweden, Norway and Russia were extremely jealous of one another, each desiring to have control of the Archipelago and that while Norway was attempting to have an international convention which should settle its status the other countries wound undoubtedly prevent any arrangement that would give Norway ultimate control.

Plea for a Conference. Sir Arthur held that any movement toward such a conference was premature and uncalled-for; but Mr. Longyear urged that some concerted action ought to be very soon devised, since American and British interests in Spitsbergen were constantly increasing in import-

OLD CANNON, TRONDHJEM

RAILROAD STATION AT HELL

ance and required protection. The British Minister gave no intimation of what his Government would do, but from information acquired through other sources Mr. Longyear felt certain that it would take the same position as the United States Government was likely to take.

Mr. Longyear and his party returned to London on Monday, September 6, by steamer from Kristiania to Hull and by special steamer-train. They found that accommodations on the trans-Atlantic lines were practically all preëmpted until into October; but through the good offices of an American Express Company clerk, they secured one room on the *Canada,* sailing on September 9, and one on the *Grampian,* sailing on the 18th from Glasgow. Mr. Longyear, having invitations to visit friends, waited till the later boat, and reached Brookline by way of Montreal on the 26th.

During the following winter, the question of the proposed conference concerning the status of Spitsbergen was the occasion of a good deal of solicitude and of correspondence, private as well as official. Since the Norwegian suggestion did not commend itself to the other Powers and the breaking out of the Great War rendered nugatory the actual deliberations of the International Conference which met a few years later, it will be convenient to postpone the story of it till a succeeding chapter.

4. BURRALL'S LAST WEEKS AT SPITSBERGEN

Burrall remained behind to complete his season's work and continued sending reports of affairs in Spitsbergen and in Norway. He wrote on August 30 regarding the chartered steamship *Locksley.* She had been delivered to them on the 9th and was in their service just three weeks. It took twice as long to load her at Advent Bay as had been expected.

Obstacles to Loading. The chutes developed unlooked-for faults. Sunday intervened and only a few of the men were willing to do emergency work; they could run only the aërial tram. The next day the *Kong Harald* arrived and

through the kind offices of one of the stewardesses an ample supply of whisky was distributed among the men: not until the end of three days were conditions restored to normal. A severe gale blew from the southeast and all outside work was at a standstill. On Thursday, the 18th, at midnight the loading-pocket at the upper terminal of the aërial tram was emptied and nearly all the rest of the cargo was loaded by the gravity-tram from the stockpile at the rate of two hundred to two hundred and twenty-five tons in twenty-four hours. One hundred and thirty tons should have been put into the bunkers, but through a misunderstanding of the capacity of one side the error was not discovered until just before the vessel sailed; it was deemed inadvisable to hold the ship for loading the extra twenty-one tons, as she would have to be turned round at the dock. On the way down she was delayed more or less by fog and on her arrival at Trondhjem had to wait for high water, so the unloading could not begin until Friday the 26th. In order to save the extra cost of Sunday work, she was held until Monday morning. A bonus of two hundred kroner served to speed up the crew: the actual time of discharging the cargo of nearly eighteen hundred tons was two days and a half—a record for Trondhjem. The expense of chartering, loading and discharging the *Locksley*, with every detail included, was only nine ører less than eleven thousand, two hundred and ninety kroner, "making a total cost of six kroner and three hundred and eight one-thousandths a ton from the time the coal was loaded at Advent Bay until it was delivered into the Nordenfjeldske Company's lighters" at Trondhjem.

At Advent Bay the officers of the *Kong Harald* refused to tie up alongside the *Locksley* for fear of soiling their ship's coat of white paint: she had to be loaded from lighters and the weather being bad, she took on only thirteen tons. The Spitsbergen whalers bought less than was expected. About a thousand tons were still in the stock-pile, most of which would have to be left there through the winter. Gibson was remaining at the mine until the last gun was fired.

S. S. "LOCKSLEY" LEAVING ADVENT BAY WITH FIRST CHARTERED CARGO OF COAL

S. S. "LOCKSLEY" LOADING COAL AT ADVENT BAY

Burrall to Anker. Burrall wrote a letter to Christian Anker informing him that the men whom he had found working on the property of Ayer and Longyear at Green Harbor had been ordered to stop and to remove the hut and sign-posts they had erected; they had indeed ceased working, but had not removed the hut and sign-posts.

"We have no use for these things," politely wrote Mr. Burrall, though with a touch of irony, "and do not wish to buy them and I therefore warn you that if they are not removed from our property by July 1, 1910, we shall remove them for you, reimbursing ourselves in an equitable manner for our trouble in so doing. I am aware that it is now too late in the season for you to undertake the removal this year and am accordingly extending the time allowed to next year. Your men are well aware of the boundaries of our lands, if they have taken the trouble to read the inscription on our sign-posts fronting the whaling station, and they have also seen a copy of our registered map."

Anker affected to be greatly grieved at the imputation that he was guilty of trespassing on the lands of so good a friend as Mr. Longyear, but nevertheless continued his vicarious speculation.

On his third trip to Spitsbergen, after the Longyear party had returned to America, Burrall found the weather had continued remarkably mild even till the middle of September; water was running in the stream beds. This was very favorable for work on the concrete warehouse and the stable, as well as on the foundations under the coal-pocket and to get the bridge-filling about completed. The company's doctor had taken French leave, and there were strong suspicions that he had gone into a panic about overwintering, and "so got sick." There seemed to be no way of securing proof of this Arctic disease of malingering in his case, and Burrall thought that the doctor could get plenty of witnesses to swear that he had been so ill with rheumatic fever that it required several men to hold him in bed; moreover the doctor of the Tromsø hospital had given him a certificate to that effect. The men

at the mine agreed to waive the doctor clause in their contracts until another one could be brought up from Norway, and Burrall got the *Munroe* unloaded as expeditiously as possible, so as to get back to Spitsbergen with a substitute doctor. Fortunately Saether had succeeded in securing the same one as had been there the previous winter.

Improvements at the Mine. While Burrall was thus unexpectedly absent from the mine in order to get the new doctor, Gilson had dug out the foundation space for the proposed new power-house, and filled it in with solid concrete. Enough screened sand was brought across from the other side of the bay for building the house, which could therefore be got under way in good season the following spring. Arrangements were made for widening the incline and the road from the stockpile to the dock so that much larger cars might be used, and considerable progress had been made in this improvement. Burrall found that with the prospect of returning to Norway the outside men were not working to their utmost efficiency; so instead of remaining until the first of October as he had planned, he gave orders for the *Munroe* to turn her prow to the South on the evening of September 29, and arrived at Trondhjem on October 7. He wrote: "The winter force on the island numbers fifty people, all told, forty-five being at Advent Bay and five at Green Harbor. They were all in good spirits, and the supplies were in excellent condition, so we see no reason why this coming winter should not be even more successful than the last."

The *Munroe* was put into her winter berth on the 13th to remain until Gibson should return from America and take charge of the repairs which would have to be made for the next season's campaign. The two men left Norway on the 19th and after visiting Kristiania and Berlin reached Boston about the middle of November.

5. THE UNITED STATES GUANO LAW

When Mr. Longyear learned of the guano-deposits at Auk Cliff he recalled one of the United States statutes, which

seemed to cover possession and protection of this particular eyrie. In the year 1858 the famous Guano Statute was passed by Congress as a tender attention to the embattled farmer, who at that time was entirely dependent for this kind of soil-enrichment on the Chincha Islands of Peru, and Peru levied an export tax which was regarded as a terrible burden. The statute provided that the discoverer of guano on any unclaimed island or islands should file proof with the Department of State, and on perfection of such proof and proper declaration in due form that the land appertained to the United States of America, Congress might grant to the fortunate discoverer exclusive rights of occupation, of exploiting the guano, of bringing it to the United States, and of selling it to American citizens for use within the United States. Congress at first regulated the price at eight dollars a ton in tubs delivered alongside the vessel within reach of her tackle. Jurisdiction as of the high seas was extended over such guano islands. When the guano-deposits were once exhausted the United States was under no further obligations to the territory thus temporarily occupied. Under this act a number of islands were thus annexed, stripped of their precious, but ill-smelling product, and then relinquished. In 1909 only two islands were still held on this precarious tenure. One was the Navassa Island in the West Indies; the other was Sophia Island in the Pacific.

The Statute Extended. There was plenty of guano on this section of West Spitsbergen and it might be supposed that it came under the provision of the statute of 1858. In talking with Minister Peirce in Kristiania it occurred to Mr. Longyear that the provisions of the statute might be extended to cover coal and other legitimate American enterprises. After Mr. Longyear returned to America he and Mr. Ayer called on the Honorable Henry Cabot Lodge, Senator from Massachusetts, who was then, as now, on the Committee for Foreign Affairs, and brought the matter to his attention. He saw the point, and introduced such a modification before the Senate which without delay passed it January 5, 1910.

President Taft's Promise of Protection. It happened, however, that President Taft, in his message to Congress on December 7, 1909, had made the following reference to the invitation of the Norwegian Government to the United States to take part in a proposed International Conference to discuss and agree upon a form of government for Spitsbergen: "The Department of State, in view of proofs filed with it in 1906 showing the American possession, occupation and working of certain coal-bearing lands in Spitsbergen, accepted the invitation under the reservation above stated, and under the further reservation that all interests in those islands already vested should be protected, and that there should be equality of opportunity for the future."

The House referred the bill regarding United States' occupation of unclaimed coal-lands to its Committee on Foreign Affairs, and by that Committee it was submitted to a sub-committee, consisting of three Representatives, the chairman of which was the Honorable Edwin Denby of Michigan. Mr. Denby sent a copy of the bill to the State Department and asked its views regarding it.

Knox's Analysis. The Honorable F. C. Knox replied for the Department. After analyzing the bill, and calling particular attention to the concluding clause: "Provided, that in respect to discoveries of phosphates, coal or other mineral such exclusive right may be allowed at the pleasure of Congress without restriction of sale and delivery to citizens of the United States for use therein and without regulation of price," he went on: "I have the honor to say that, so far as the proposed amendments may apply to operations on islands, rocks, and keys, already registered under the Guano Islands Act, and may recognize the continuance of qualified dependency upon the United States after the guano has been removed, in case the discovery of coal or other minerals may make further working profitable, the proposed amendments seem to offer no serious objections.

"As to their applicability to new discoveries of workable insular deposits, it is doubtful if any unassigned or unclaimed

ANCIENT THING STONES

ANCIENT GRAVE-STONE IN MODERN CEMETERY, NEAR STEN-KJAER

island, rock, or key, could now be found to which the provisions of the amendment could apply.

"Exception may be taken to the words 'or portion thereof,' inasmuch as to leave the door open to divided claims of territorial jurisdiction could hardly fail to create complications, and provoke controversies of an embarrassing character. In the nature of things the islands, rocks, and keys, to which the Guano Islands relate, are incapable of partial or divided occupation and jurisdiction, and an attempt to extend its provisions to portions of islands of uncertain status or whose neutrality is established by international consensus would be likely to give rise to intricate questions admitting of settlement only by conventional agreements."

And in a second letter the Secretary of State said: "As this Government is pledged by its declaration to all the North Sea Powers to the position that Spitsbergen is a no-man's land, in the welfare of which all the interested nations are concerned, but over which no one Power can claim territorial control, it would not seem practicable to advance any claim on the part of the United States under the provisions of the proposed Amendment."

Denby's Concurrence. Mr. Denby, under date of February 4, immediately replied to this that he entirely concurred with the views of the Department of State. He wrote: "We have decided to refrain from action, first, because the bill would not in our judgment bring the coal-mines now operated by Americans in Spitsbergen under the purview of the Guano Act in any event, because these mines are not new discoveries; second, because our Government is already pledged to the position that Spitsbergen is a no-man's land, which position would be of necessity inconsistent with any claim, even of qualified sovereignty, over the island or any part thereof; and third, because we do not wish to embarrass the Government in the approaching International Convention to prescribe a modus vivendi for the islands."

This point of view did not, however, preclude Mr. Denby from expressing his interest in the affairs of the American

mine-owners. He said further: "We are fully convinced however, that the American interests representing the coal-mines in Spitsbergen are vested interests, lawfully and equitably acquired, and the protection of which the Government of the United States should assume."

He added: "The committee has the fullest sympathy for the American mine-owners, whose predicament has led to the introduction of the bill under discussion, and believe that their enterprise is a laudable one which should be encouraged, and should have all proper assistance from the Government.

FLAGRANT CLAIM-JUMPERS. "The one obstacle which seems now to menace the success of the American enterprise appears to be the difficulty the mine-owners are under in dealing with squatters upon their land, there being no law that they can invoke for their own protection, and they, being reluctant to resort even to the semblance of violence, have tolerated the presence upon parts of their claim of those who, under any ordinary jurisdiction, would be regarded as flagrant claim-jumpers. Thus far no special harm has resulted, but the continued presence and activities of these and other persons of similar tendencies, may jeopardize their interests."

He concluded with the statement that unless further developments in the near future should seem to make Congressional action advisable, the Committee on Foreign Affairs would not take further action in regard to the bill.

Mr. Longyear himself went to Washington and had interviews with Mr. Denby and Senator Lodge, and was easily convinced that even if the bill should pass it would not be regarded as applicable to Spitsbergen, and that further attempts to force the bill through Congress "would be injurious rather than beneficial" to the interests of the Arctic Coal Company, and of Ayer and Longyear. Mr. Longyear again saw Senator Lodge, who was satisfied that the side-tracking of his bill was wise.

It was felt that this agitation, though it failed of its special purpose, was useful in directing attention to affairs in Spitsbergen and had created a strong feeling in favor of the

United States protecting American interests there. Nathaniel Wilson, who was engaged in Washington as attorney for the Arctic Coal Company, and Messrs. Ayer and Longyear thus voiced this view:

"You have expended large sums of money in maintaining a considerable force of laborers and selected experts on the property, and in the opening of mines, in the sinking of pits and shafts, and in the construction of an aërial railway, docks, store-houses, and quarters. The results of your expenditures and labors have been to demonstrate the existence on these tracts, particularly on tracts One and Two, of large deposits of soft coal commercially valuable and usable for making steam, and to put the property in a condition for mining, transporting and shipping large quantities of coal which can be sold at some profit, provided the output is sufficiently large.

"The Government of the United States, having been kept fully informed by yearly reports by you of the proceedings and the progress of your work, recognizes the present situation of your properties and rights in Spitsbergen, and in view of the predicament of Spitsbergen, admittedly No-man's Land and not under the sovereignty of any State, and assuming the facts as to your possession and occupancy to be as set forth in the documents filed by you in the Department of State to be true, the Government considers and holds and will hold that your possession and occupancy were and are lawful, and your rights superior and paramount to those of any and all other persons who may have sought subsequently to the date of your settlement and occupation, or may seek to obtain adverse possession, or to occupy any of the lands within the boundaries of the four tracts you claim.

"The Government of the United States will assert and claim that you are entitled to have your rights recognized and your title confirmed by whatever tribunal may by consent be given jurisdiction to declare such recognition and to give such confirmation, and that in the meantime your possession and occupancy must remain and continue undisturbed."

A Sensational Article. In the meantime, a report had gone abroad that the Congress of the United States had decided to take possession of Spitsbergen. In the Trondhjem "Dagspost" of February 12, 1910, appeared a translation of the following item from "Petermanns Geographische Mitteilungen": "By an apparently innocent decision the Committee for Foreign Affairs in the United States Senate has submitted for passage on December 15, last year, a law whereby that protection which America extends to guano-claims on ownerless islands which no Government has made claim on, shall also be extended to include the finding of coal and other minerals. The matter here treated is the protection of coal-layers which have been discovered by American citizens on Spitsbergen, the dividend-yields of which shall be transferred to America. This, of course, is only a pretext. What it really means is to take possession of the first point of support in the European waters. It is not known whether or not the law has been as yet discussed in the Senate, but there is no doubt but that it will be passed."

This item caused some excitement in Norway, and a reporter for the Kristiania Sunday paper, "Aftenposten", went to the American Minister and interviewed him regarding the matter. But Mr. Peirce was diplomatically ignorant concerning the bill in question, or Ayer and Longyear's petition for governmental protection, and expressed his disbelief in the sensational article published in the Petermanns "Geografische Mitteilungen," which in its turn claimed to emanate from a New York newspaper, the name of which Mr. Peirce thought must be a mistake.

Sunday "Aftenposten" was evidently entirely friendly to the American enterprise, for it ended with a brief résumé of the history of the Advent Bay enterprise, and especially dilated on the Norwegian inception of it and its transfer to American capitalists. And after citing the part of President Taft's message referring to the case, it ended with this paragraph: "These statements, which witness a wholly intelligent position toward the Norwegian Spitsbergen proposal, do not seem at

all to harmonize with the sensational statements from America to the effect that the United States has occupied the land which has come into possession of the American coal-mine owners."

Tony Callot's Article. Other periodicals began to print articles about the Spitsbergen coal-mines. "The Engineering and Mining Journal" for December 25, 1909, devoted two columns to a description of the Advent Bay works, illustrated with three small half-tone pictures. The author, Tony Callot, an engineer of Paris, had visited there, but he makes the surprising statement that "the so-called Advent City," which had belonged to the Spitsbergen Coal Trading Company, "had been transported to the other side of the bay where the Arctic Coal Company is now at full work." He also stated that this company had delivered four thousand tons at Narvik, "which is the terminus in Norway of the most northerly railway in the world. This line conects the iron mines of Gelivara, Sweden, with the Glacial Ocean."

Fields for Speculation. The eyes of speculators were more and more turning in the direction of Spitsbergen, which, though not like the gold-fields of Cape Nome and the Klondike, tempting with fabulous hoards of yellow gold, seemed to offer other glittering yields, such as mica and asbestos. In November, 1909, counsel in New York for an agent for Norwegian mines, and holding a small interest in a land association of which Mr. Longyear was general agent, tried to interest Mr. Longyear in some "great coal and asbestos fields" which certain clients of his had discovered at a point "very near to an excellent protected harbor in Spitsbergen." A copy of a letter from a lawyer for the discoverers, addressed to his brother, with whom the New York man was associated, was forwarded to Mr. Longyear as an attractive bait. This letter told how a scientific expedition, financed by a Norwegian, had gone to Spitsbergen the previous summer, with the intention of annexing coal-fields as its subsidiary motive. "Such coal fields," says the letter, "were discovered in abundance and annexed," in accordance with international law and

convention, the private ownership being "recognized for the party which occupies land in a harborless country." What was meant by a harborless country was left to the imagination.

The University of Kristiania and the Norwegian Government were said to have equipped the expedition with instruments and materials, and the two principal leaders, Berger Jacobsen, "a well known geologist," son of Herre Oskar Jacobsen, Secretary of Labor and Commerce, and also Secretary of the Army and Navy for Norway, and Lieutenant Vandelboe, of the Norwegian Army, "made an expedition into the country where no other man has been before, and they found a mountain which contained asbestos, cryolith, and other minerals." Jacobsen and Vandelboe's report of their discovery was included in the letter. They said:

"At the end of August we discovered asbestos-fields on Spitsbergen. The condition under which we discovered these fields, being just after our ship was wrecked, was such that we had no opportunity to go into the discovery very deeply, nor did we make a map of the fields. The discoveries were made accidentally under a shooting trip, and as the work of saving the wreck took almost all our time and energy in the two days we were in the fjord, we were cut off from making another trip to the asbestos-fields. A whaler came unexpectedly and took us to Norway. The mountain containing the asbestos was about fifteen hundred feet high, and about seven thousand feet in the trapezoid-formed section, and about six miles long.

Graphite. "The asbestos appeared in the open at a height of about thirteen feet from the coast line, and in about eight inches, running at a right angle of the other minerals. About parallel with this were two other layers of the same dimensions. The color was gray and the other mineral was, as near as we could judge, hornblende and serpentine. We also discovered graphite in the gravel."

A rough sketch of the front view and of the profile of the asbestos mountain was appended, and the report concluded: "These asbestos-fields are located at the best harbor in Spits-

bergen, which is ice-free from July to September and protected against wind and weather. The depth of the water is as favorable as possible, and about fifteen fathoms at fifteen feet from the coast line outside the asbestos mountain. In this connection it may be stated that on the other side of the 'fjord are tremendous coal-fields which may be used for utilizing the asbestos-field.

"We did not look into the other minerals which always are present in asbestos-fields, such as kryolith, iron, lead, etc., but the owner of asbestos-fields can claim the ownership of the other minerals.

"We would state that these asbestos-fields are not annexed as far as we know."

The Norwegian lawyer stated that his client's intention was to send up to Spitsbergen a new expedition, as soon as the conditions of the ice should permit, and "annex" the asbestos-fields, "probably the richest in the world." He continued: "To equip such an expedition is needed according to Norwegian condition quite a sum of money, as the men who are going up there do not want to do this for nothing. . . . .

"It is to be supposed that there will be made quite some expeditions to Spitsbergen next summer, especially from Sweden, and even if there is little chance that these expeditions will happen to fall upon our asbestos-fields, we are not going to risk anything, but expect to be the first men on the place, and be sure of the ownership.

"The company here is willing to make this expedition and go to the mentioned asbestos-fields for a consideration occupying it in a lawful manner, and then give to the party who supply the money for the expedition fifty per cent of the rights of the company."

Illimitable Prospect. The size of the field seemed to be illimitable, the price of asbestos promised to be two hundred and seventy dollars a ton, and the cost of mining it would be comparatively small. The writer thought that an advance of ten thousand dollars would amply suffice to finance the enterprise. But as the time was very short, and several persons in

Germany and England were desirous of taking the matter up he required an immediate decision.

Mr. Longyear replied courteously but decidedly that the information regarding the alleged asbestos-veins on Spitsbergen was so meager that the proposition did not look attractive to him, and he could not do anything with it.

END OF VOLUME I

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